The Chemical Age

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How the Brute Must be Fed

AT last a very Daniel is come to judgment, to confound the empirics, to tell us from long observation, experience and multiple trial—just simply, how we are *not* fed but should be! These two last Mondays, at the Royal Society of Arts, in a series of three Cantor Lectures (to be completed next week), Major-General Sir Robert McCarrison has dealt with the subject of "Nutrition and National Health" in a way that is possible to no other man—on account of his special experience as a student of the subject in India, during the years 1901 up to his recent retirement. He entered the Indian Medical Service in 1901. Posted in Chitral, in 1905, he was led to take up the special study of Chitral fever. He then entered the Foreign and Political Department and in 1906 was stationed in Gilghit, which he found full of goitre and cretinism; he made a special study of these diseases up to 1911, when he went home to give the Milroy Lectures on goitre. He returned to India in 1913 and was put on special duty to continue his studies. After the war, he was sent to Poonoor, where he built up a great experimental station for the special study of deficiency diseases as found in India.

Sir Robert McCarrison has thus had the opportunity of contrasting the development and health of the peoples of India, from the frontier downwards, with their varied dietaries. He has also carried out experiments with rats, on a vast scale, testing the effect on these of the actual native diets. The rat has been chosen because the cycle of development is completed about 30 times as fast as in man—so that an experiment with rats lasting 140 days may be taken as corresponding with one made under the same experimental conditions during nearly twelve years with man. Having full space at his command and a large staff of disciplined native workers, Sir Robert has been able to maintain his animals under entirely healthy conditions. So impressed has he been by the adequacy of the diet of the northern Indian, as displayed in his physique and health, that he has used this, in his later years, in an experiment in which an average stock of 1,000 rats was fed daily, during about 2 years, a period approximating to 50 years of human life. During the five years prior to his leaving India, there was no case of illness in this stock, no death from natural causes, no maternal mortality, no infantile mortality.

The diet chosen would seem to contain in abundance every element and complex needed for normal nutrition. It consisted of *chapattis* (thin cakes of whole-wheat-grain meal) lightly smeared with fresh butter, sprouted Bengal *gram* (pulse), raw fresh vegetables (cabbage and carrots) *ad libitum*, milk, the hard crusts of bread (to keep the teeth in order), a small ration of meat once a week and water. The diet of the Madrassi, who come at the lower end of the scale in development and health, has many faults—it is excessively rich in carbohydrates and deficient in suitable protein, mineral salts and vitamins. A remarkable diagram was shown, giving the individual weight curves of the growth of young rats fed either on white wheat-flour or on whole-grain-meal, alone or in combination with either butter or yeast or with both. The former show a remarkable comparative inferiority in growth. Moreover, the mortality of those fed on the white flour diets was 30 per cent. as compared with 4 per cent. in those fed on whole grain meal. The dangerous inferiority of white flour is placed beyond question.

The lectures are an almost complete treatise on Nutrition and Health. They will be on sale at the third lecture and afterwards at 2s. 6d. the copy. We advise early purchase. The members of the Houses of Lords and of Commons should be forced to study them. To judge from recent correspondence in the Press, the subject is at last attracting public attention. The great point brought out in the lectures is not the need of this or that vitamin or other substance in particular but of all of a great variety of materials in balanced association. Study of the minute anatomy, by close post mortem examination, clearly shows that whatever the deficiency may have been, the effect is general, although a certain marked response may be specially apparent in this or that case. Water, common salt, lime, iron, are just as necessary as any so-called vitamin for complete health; our ordinary foods are all too commonly deficient in quality, because of the lack of attention to such matters in growing ordinary crops. Our whole system of agriculture needs revision in the light of these experiments. The "Lancet" last week called attention to the great loss of water as perspiration in hot climates and the consequent withdrawal of an amount of common salt far beyond that in the daily food; to this simple cause may be due much of the vague "malaise" of whites in the tropics.

In fact the lessons to be learnt from these lectures are innumerable and of the highest public importance. It is obvious that complete reform in medical education must be made, so as to place medicine upon a scientific footing. The profession has too long had hold of the wrong end of the health stick. It is impossible to overrate the impression upon those present, not merely of Sir Robert McCarrison's words but of his pictorial demonstrations of details.

Notes and Comments

Toxic Gases in Industry

A PROBLEM which has assumed considerable importance during the past three years and on which investigation is actually in hand is the quantitative detection of small concentrations of the toxic gases most commonly encountered in industry. The problem has been brought under investigation under the joint auspices of the Home Office and the Association of British Chemical Manufacturers primarily in the interests of the safety of workers in the chemical industry, though the results will, of course, be applicable to other industries in which such gases are encountered. Mr. J. Davidson Pratt, general manager of the Association of British Chemical Manufacturers, disclosed for the first time in his paper to the Institute of Chemistry this week details of the tests for all the gases in question, and led us to believe that in due course, when works tests have proved entirely satisfactory, the details will be published by the Association in conjunction with the Government. When that is done it is to be hoped that all chemists in industry will acquaint themselves with the methods and see that they are applied whenever there is a possible danger from gassing, and thus contribute to the safety of industry by eliminating a type of accident which should be entirely preventable.

The Rubber Market

ACCORDING to a report on the rubber situation which Charles Hope and Son have just issued, production seems limited to little more than half the normal output. With rubber at its present price of under 7d. per lb., it is hard to expect producers to be satisfied. At that figure very few estates can show a reasonable profit and no one will contend that generally speaking anything under 8d. per lb. can be called a "fair and equitable" price. It appears that the price to be aimed at is about 9d., and it is abundantly clear that, with reduced output, production costs rise, the increase per lb. being out of all proportion to the increase in the percentage of restriction. When world stocks are reduced to a normal level the International Committee should have no difficulty in establishing and maintaining a fair and reasonable price. World consumption during 1935 was about 940,000 tons; world stocks at the end of last year were about 491,300 tons. During 1935 world stocks were reduced by 68,000 tons. Production in 1936 depends on the basic quota permitted. With 60 per cent. for the whole year world shipments should amount to a little over 800,000 tons, which in all the circumstances should be adequate. If trade in the United States continues to be good and there is no political upheaval in Europe, this year's consumption should exceed 950,000 tons.

Central Scientific Bibliography

CONSIDERABLE progress has been made in connection with the organisation of the central agricultural and scientific bibliography to which reference was made in these columns six months ago, and the scheme is so far advanced that it will come into operation on March 1. Those interested in original work or research in agriculture and allied industries can join as ordinary subscribers from that date. The scheme will operate from the Science Library, South Kensington, by permission of the Board of Education. The list of "original subscribers" is now closed, and this includes many influential names in agriculture as well as important firms such as Imperial Chemical Industries, Ltd. Through the aid of Mr. E. W. Meyerstein, the retired stockbroker who lives at Dunton Green, near Sevenoaks, who has made many generous contributions to charities, the amount required for the necessary guarantee fund has been subscribed under his own guarantee. For the present the scheme is concerned only with agricultural and allied industries, but other sections will be formed in due course for mechanical engineering, electrical engineering, civil engineering, industrial chemistry and physics. In the meantime those wishing to join these sections may temporarily join the existing section and secure their special information in that way. We gather from Mr. W. P. Dreaper, the hon. secretary *pro tem.*, that when the scheme is fully in operation it will be possible for research workers to have forwarded to them all the available information they require on a given subject without having to go to the libraries. It will be possible to save as much as a whole year's investigations in this way.

A Good Scheme

ANY movement that will promote a knowledge and understanding among the younger generation of the working of the vast machinery of international trade is worthy of encouragement, even if it means adding to the already long list of societies. For that reason we welcome the Public Schools Business Society, which is being established to assist young men starting in, or engaged in, business careers. Its object is to set up a meeting place in Central London at which men and women prominent in the business world will give addresses on subjects relating to the general knowledge of business affairs and national and international commerce. Those working in different businesses will be able to meet together and interchange ideas and experiences. Occasional addresses will be given by men and women distinguished in other spheres in order to preserve and develop those cultural interests without an understanding of which no man is able to give or take his full share in life. Information will be available as to where specialised study of any subject may best be obtained and the Society will also advise its members on such matters as suitable residential accommodation and the satisfying of such domestic needs as the darning of socks and the mending of clothes. Membership will be extended to young business men from overseas as a result of which it is hoped that international ties may be strengthened. Membership will be open to all who have been at schools represented at the Public Schools Headmasters' Conference and now engaged in, or awaiting employment in, business. Those who are willing to become foundation members or to promise to become members as soon as the Society is formed, are invited to communicate with the hon. organising secretary, Mr. K. Hare-Scott, 12 Cranley Gardens, London, S.W.7.

Making Oil from Coal

Professor Bone Exposes its Economic and National Aspects

Professor W. A. Bone, Professor of Chemical Technology, Royal College of Science.

A DISCUSSION on the economic and national aspects of the production of oil from coal was opened by Professor W. A. Bone, F.R.S., at an informal meeting of the Institute of Fuel at British Industries House, London, on February 14. Lord Strabolgi presided during the early part of the meeting, but having to leave early he was succeeded in the chair by Professor C. H. Lander.

The discussion, said Professor Bone, was intended to be an unbiased and dispassionate effort to get at a true perception of the economic and national aspects of the oil from coal problem apart from any sectional interest. As an investigator, whose life had been devoted to the scientific study of the manifold problems of coal and combustion, he had certainly no axe to grind or interest other than the national to serve. He concentrated on three aspects of the question: (1) The country's coal consumption and employment in mines, (2) its public exchequer and finance, and (3) its security in war.

Oil had completely displaced coal as a naval fuel, whilst in the world's mercantile marine service there were some 20 million of oil-fired steamship tonnage and nearly half as much more propelled by oil-burning internal combustion engines of the Diesel type. Since 1913, our exports of ships bunker coal had fallen from 21 to 13.5 million tons per annum. The displacement of coal by oil as a marine fuel was attributed to oil's 40 per cent. greater concentration of potential energy, its freedom from ash, its greater flexibility and its easier handling, storage and combustion control. In view of the world's already assured abundance of petroleum for the next generation or two, there seemed little prospect of coal regaining what it had lost as a naval fuel. So far as ship and naval uses were concerned, the demand was for a heavy oil and not petrol.

Road and Air Transport

In road transport and the aeroplane, oil had not displaced but had rather supplemented coal. The possibility of the Diesel engine supplanting to some extent the coal-fired steam locomotive in the world's railways must also be envisaged. The Institute's president, Sir John Cadman, had expressed the opinion that the 13 million tons of coal used annually on British railways could be effectively replaced by less than two million tons of Diesel oil, a prospect more pleasing to railway stockholders than to colliery proprietors and coal miners. Moreover, in recent years oil had begun to compete with coke and anthracite for the central heating of large buildings in the Metropolis; and although the Gas Light and Coke Co. was countering this competition by introducing automatically fed and thermostatically controlled coke-fired boilers for central heating plants, heavy oil (which was perhaps even more flexible and easy to control) must be reckoned as a serious competitor with coke for central heating plant.

Liquid fuels of one sort and another had therefore come to stay, and most likely would compete increasingly with solid fuels the world over before any equilibrium in the usage of the two classes was reached. For the next generation or two there was no more fear of an oil shortage than of a coal shortage in the world; the potential energy of the present world's oil consumption of about 200 million tons per annum was equivalent to that of some 300 million tons of coal per annum, or to that of about one-quarter of the world's present black-coal output. Indeed, it was rather greater than that of the present annual output of coal in Great Britain.

As to the nation's attitude to the problem, certain ruling considerations should be kept in mind. In the first place, coal and oil when rightly viewed, and in the long run, were not so much competitive as supplementary fuels. It would be folly not to make the fullest and best use of each; in some circumstances, and for certain purposes, it would be more economical to use coal than oil, and vice versa. He (Professor Bone) suggested that in the long run the best policy for the nation was to impose no let or hindrance upon the use of either in its proper circumstances, leaving those to be determined as they arose, without prejudice in the courts of science and experience. However justifiable might be the taxation of motor fuel as a convenient and equitable means of making the users of motor vehicles pay for the maintenance of roads, there seemed to be little justification in our taxing imported heavy oil merely to prevent its displacing coal, for by so doing we not only confessed the advantages of oil over coal (or coke) for some purposes, but were depriving ourselves of them to our injury, which would be foolish.

Britain's Coal Resources

Britain possessing plenteous resources of high-quality coal but practically no natural oil, and requiring large amounts of oil fuel, must needs become a large importer thereof. In 1933 she had imported over 1,000 million gal. of motor spirit, about 560 million gal. of fuel oil and nearly 400 million gal. of crude petroleum, say, about $8\frac{1}{2}$ million tons of fuel oils altogether (exclusive of 185 million gal. of kerosene, used chiefly for lighting, and nearly 100 million gal. of lubricating oils). The total c.i.f. value of the imported fuel oils was £21,000,000, or about £2 10s. per ton, and presumably included a good proportion of freightage, mainly in British tankers, and some insurance. It would be interesting to know the corresponding f.o.b. cost at the foreign shipping ports and the amount of British labour employed in transporting it from thence to storage tanks in Britain. Presumably, also, the imported oil had to be paid for by exports of the products of British labour.

Tax Gathering for the Bureaucrats

Before such imported oils reached the consignees, however, the King's customs waylaid them and extracted duties amounting in all (in 1933-34) to £39.82 millions. Of such amounts, some £26.5 millions went into the Road Fund and presumably the remainder into the public exchequer, which thus appropriated about £14 million as a direct tax upon the users, most of whom were harmless British subjects, peacefully pursuing business or pleasure and trying to lead decent, honest lives, with wives and children, out of the pittance that remained after rate and tax collectors, and customs and excise officers, had robbed their pockets in various ways. It was

not the cheerful foreigners, but our own miserable selves who paid all these duties; and the less of them, the more spending money would be left us wherewith to employ labour and revive the country's trade. Moreover, by meekly bearing all this high burden of taxation we were encouraging the expansion of an already inflated bureaucracy, who were surely the dearest domestic animals that we reared for our amusement. But if we could replace all this imported oil by that brewed from our own coal, would a kind and grateful Chancellor of the Exchequer merely forego *half* his present duties, and dismiss an equivalent of bureaucrats, so as to avoid imposing equivalent other taxes? The answering echo was "No!"

Low Temperature Carbonisation

Against all this imported oil fuel in normal times we might produce some 70 million gal. of benzol per annum, or not more than about 7 per cent. of our present motor spirit requirements, by the high temperature carbonisation of 35 million tons per annum of coal in coke ovens and gasworks. There was also the prospect, scarcely yet realised, of obtaining petrol by the low temperature carbonisation of coal; but it was questionable how far such means, even if practicable, would suffice. In Professor Bone's opinion, there were so many serious obstacles to our rapid and eventually great expansion of low temperature carbonisation that it could not be reckoned seriously as a solution of the problem, despite the enthusiasm of its advocates. But even were their most sanguine hopes fulfilled, and, say, 40 million tons of coal per annum were carbonised at a low temperature to produce 28 million tons of smokeless semi-coke, we might therefore primarily obtain possibly about 100 million gal. of petrol and some 600 million gal. of fuel oil of inferior quality—or less than one-tenth of present petrol and two-thirds of our present fuel oil requirements. There would be no expansion of the supply, but only a prospect of gradual contraction as gas or electricity further displaced raw coal in domestic heating and cooking. Personally, however, Professor Bone doubted whether low temperature carbonisation would ever play more than a useful, but subordinate, part in solving our oil from coal problem.

Thanks to the enterprise of Imperial Chemical Industries, Ltd., and the skill of the Billingham technical staff, the possibility of producing a material proportion of our petrol and fuel oil requirements by the pressure-hydrogenation of our raw coal itself and/or its tars was presumably the new factor in the situation which had prompted the discussion. Naturally, everyone concerned wished to know how far the new process could be considered as an economic means of producing petrol from coal in quantities sufficiently large to make it worth while as a national effort. In such connection possible alternative policies should also be considered. He suggested as a real consideration that, inasmuch as nature supplied an abundance of petroleum for the mere drilling of a hole in the earth, she had thereby set a limit upon what man could afford to spend upon converting her coal into oil, however clever he might become at it. Also, there was a narrow limit to justifiable expenditure in preparing or upgrading any raw fuel to perform its proper function either under a boiler or in an internal combustion engine.

A Brilliant Technical Achievement

Admittedly, the new hydrogenation process at Billingham was a brilliant technical achievement, for which I.C.I. and its experts deserved the highest praise and congratulations. He (Professor Bone) had always felt that the project of erecting a full-scale plant at Billingham was in every way justifiable, because it provided the only means of ascertaining the costs of producing petrol from British coal and of gaining sufficient technical experience of the process to ensure that those costs had been reduced to the lowest point.

With all that admitted, however, there seemed little present prospect of its producing petrol at a cost anything like so low as the present c.i.f. price of imported petrol, which is something like 3⅜d. per gal. (or in the year 1933-34 about 3d. per gal.). It was difficult, and maybe impossible, at present to say what was or what would be the ultimate cost of producing petrol by the new process, because until the depreciation factor had been ascertained by working experience, one of the heaviest cost items was problematical. But, taking a moderate view, Professor Bone suggested that for the purpose of the discussion a total cost of less than about 6d. per gal. of petrol could scarcely be assumed; and as the Government had consented to an excise duty of 4d. per gal. on home brewed as against 8d. per gal. on imported petrol, the assumed minimum of 6d. for the cost of home brewed, as against 3⅜d. c.i.f. for the imported product, was probably not far out. From the national point of view the question narrowed itself down to how far we should be justified in spending 6d.'s in producing as many 3⅜d.'s worth of petrol, having regard either to increasing employment in our mines or to national security.

Economics at Billingham

The paper presented to the Institute recently by Mr. Kenneth Gordon showed that the present hydrogenation plant at Billingham was erected at a total capital cost of £5,500,000 to produce 100,000 tons of petrol from 600,000 tons of coal and a further 50,000 tons from creosote oil and low temperature tar, and that its thermal efficiency was about 40 per cent.—which compared with, say, 80 per cent. for a modern gasworks and 25 per cent. for the best electric super-power station. The raising of the required 600.000 tons of coal per annum would employ about 2,300 persons per annum at the mines; and he gathered that some 2,000 persons were at present employed on the plant itself, but that the number would probably be reduced when steady running was achieved and that it was substantially greater than would be necessary for an independent works making most of its hydrogen from hydrocarbon gases instead of from coal. Hence, the total necessary labour in mines and the Billingham plant might be placed provisionally at not less than about 4,000 persons. If the Exchequer lost 4d. per gal. (the difference between the excise duty and the import duty) on the 45 million gal. which the plant would produce (assuming 300 gal. per ton of petrol), the Exchequer would lose altogether £750,000 on the production.

According to Mr. Gordon, however, a new plant of the same petrol-producing capacity would make 100,000 tons of petrol from about 375,000 tons of raw coal, which would cut down the labour to 1,450 per annum at the mines. Probably the total labour in mines and plant would not exceed 2,300 persons to produce altogether 150,000 tons of petrol per annum, on which production the Exchequer would still lose altogether £750,000. If, however, one ignored the Exchequer loss and regarded such a plant as producing petrol at a loss of 2¼d. per gal. as compared with the imported spirit, the loss to the nation would be only £420,000 per annum. The production of such a plant, however, would have replaced less than 5 per cent. of our 1933 petrol imports, not to speak of our imports of fuel-oil and crude petroleum To produce *all* the petrol imported in 1933 would have required about 22 such plants, and would have entailed a loss of about £16.5 million per annum to the Exchequer, or of about £9.28 million per annum to consumers.

The Unemployment Problem

The new *ad hoc* employment created would have been about 32,000 to 50,000 persons per annum in the mines and another 35,000 per annum on the plant, or from 67,000 to 85,000 persons altogether. Against this, however, would have to be reckoned unemployment of seamen in the tankers which otherwise would have transported 1,000 million gal. of petrol to our shores, and people that would have been employed, but were not, in making the goods exported in payment of such petrol. In other words, we should ask ourselves would more be gained on the swings than would be lost on the roundabouts? But whatever might be the correct answer, he (Professor Bone) was inclined to think on balance the

home-brewing of the petrol would not have greatly affected unemployment as a whole, though it might have put 35,000 to 50,000 unemployed miners back into work.

From the foregoing it was clear that, if a coal-hydrogenation industry for the production of petrol was to be developed in this country, it would have to be subsidised in some way either directly or indirectly by the State, on the plea of rendering the country free of imported petrol for defence in times of war; and probably a majority of our people would approve of a moderate subsidy for home-brewed petrol were it the only or best means of ensuring beyond doubt petrol for, say, our air and naval defence in war-time. For in war-time there would be large and imperative demands for petrol, the complete satisfaction of which would be vital to national security, and, even if petrol could be got in, a certain proportion of the tankers would be diverted or sunk by hostile ships or aircraft, and the price of that which got through might rise inordinately. Hence, plants that could produce petrol from coal at 6d. to 9d. per gal. might prove, if not absolutely essential to security, at least a sound precautionary investment.

Against such argument, however, must be set the consideration that coal-hydrogenation plants would offer big targets to hostile aircraft; and it was certain that an enemy would make them one of his first objectives. If such attacks were successful the security of home-brewed petrol supplies might vanish in a few days. This was an aspect of the case which could not be disregarded, for a mistake might be fatal, and as the lives and liberties of all would be at stake, dare or ought we to take such a risk?

Safeguarding Oil Storage

As an alternative policy Professor Bone suggested the underground storage in time of peace of a sufficient supply of petrol and/or crude oil to meet all likely war demands for a year or two. Indeed, it might be suggested that in any case such a measure was necessary to security, whether the petrol be home brewed or imported, because any system of storage above ground would expose us to perils which at all costs should be avoided. It should be possible to construct underground reservoirs at convenient places near to suitable ports, with buried pipe-lines to selected centres. He had been told that the capital cost of present-day above-ground storage of petrol or crude oil might be taken as only £1 per ton, or equivalent to an annual charge (at 7½ per cent. for interest and depreciation) of only 0.06d. per gal.; and although a system of underground storage and pipe-lines would be several times more costly, yet it should not be prohibitive, and might be the cheapest and best way of ensuring the security which was so vital a necessity (1,000 million gal. of petrol would require 160 million c. ft.). The present capital cost for above-ground storage would be something like £3,500,000.

More Subsidy Chatter

In the course of the discussion more than one speaker referred to the necessity for a subsidy to enable a plant (for the production of petrol from coal) to pay. The final decision of the Government, in 1933, was to guarantee for a period of years a minimum difference of 4d. per gal. between any excise and customs duty. The present difference is 8d. In the case of the Billingham hydrogenation plant, which would produce 150,000 tons of petrol per annum, at 8d. per gal. the subsidy was £1,500,000 per annum, paid by the taxpayer, or at 4d. per gal. it was £750,000 per annum. That amounted to £6,000,000 before the arrangement terminated. At four tons of coal per ton of petrol, and taking only the petrol obtained directly from coal, 400,000 tons of coal would be used to produce 100,000 tons of petrol; the subsidy, therefore, worked out to £2 10s. per ton of coal at 8d. preference, or £1 5s. per ton at 4d. Many other processes which had been looked upon as impossible would present a very different balance sheet with subsidies much lower. The much-criticised Richmond plant, erected at Government expense in order to ascertain whether a particular system of low temperature carbonisation would pay, would have shown handsome profits with a comparatively low subsidy; indeed, practically all of the many low temperature plants that had been tried out on a large scale and had failed to pay would have survived and a substantial industry would have been assured.

A fair amount of discussion was devoted to the claims concerning the advantages the nation derived from the Government assistance in hydrogenation. One of the advantages was permanent employment. But it was suggested that a much smaller subsidy in many other directions would give infinitely greater employment. On the basis of 4,000 workers and miners employed, the subsidy amounted to £375 per annum per man with an 8d. preference. One speaker pointed out that if taxpayers' money were to be spent on decreasing unemployment the problem was to create the maximum amount of employment for the minimum amount of money, and the figures given were not very encouraging.

War-Time Troubles

The present plant produced 4 per cent. of the peace-time requirements, and the war requirements would be many times as much. It would appear that, to deal with the quantity of petrol already used, a capital expenditure of, say, £100,000,000 would be required, at peace-time prices, and very much more under war conditions. Also, even for such a limited programme, some 300,000 man years would be required for construction, 50,000 men for operating and 50,000 miners for supplying the coal. Was it likely, it was asked, that such priority of capital, labour and materials could be obtainable or even be desirable in the event of war? Again, in a comment on the targets which such plants would present to hostile aircraft, a speaker asked if it were really a serious exaggeration to suggest that every ton of petrol produced in such plant in war time would be required for the sole purpose of defending it.

More than one speaker expressed the view that it was a mistake to erect a plant so big as that at Billingham. It was suggested that the most that should have been done for the time being in hydrogenation was to erect a plant of the minimum size to calculate accurately the costs of the process and to continue research on a fairly large scale. The problem should still have been regarded as one of acquiring knowledge of the properties of coal, so that such knowledge might ultimately be utilised to formulate really sound schemes of development probably involving many other processes.

(To be continued.)

Institute of Chemistry

Liverpool Section : Historical Lecture

A MEETING of the Liverpool and North-Western Section of the Institute of Chemistry was held on February 13, when Mr. Richard B. Pilcher, registrar and secretary of the Institute, gave a lecture entitled "From Boyle to Priestley." This lecture was essentially a continuation of that on "Alchemists and Chemists in Art and Literature," which was given before many sections of the Institute and published in 1933.

Mr. Pilcher introduced, by lantern slides prepared mainly from his collection of prints, the chief characters in the history of chemistry within the period indicated, namely, characters born between 1627 and 1733. This was a period of absorbing interest, recalling such men as Kunckel and Lemery, the greatest chemists on the Continent contemporary with Boyle; Becher and Stahl, of the phlogiston theory; Mayow and Stephen Hales, remarkable for their experiments on gases; Boerhaave, the great teacher of Leyden; Geoffroi and Réaumur, of the French Academy; Duhamel, pioneer in agricultural chemistry; Rouelle, the whimsical demonstrator at the Jardin des Plantes, who discovered sulphuretted hydrogen; and many others, up to the times of the famous British chemists—Black, who propounded the theory of latent heat; Cavendish, who discovered hydrogen and the constitution of water, and Priestley, the discoverer of oxygen.

My First Visit to the British Industries Fair

Chemical Products at the London Section

By AN OVERSEAS BUYER

VISITING the chemical section of the British Industries Fair for the first time as a buyer foreign to this country, I have been much impressed by the range of products which are offered by the British manufacturers of chemicals. Prominent in this respect there was much to see at the stands occupied by A. Boake, Roberts and Co., and W. J. Bush and Co. The former firm is exhibiting a very large number of fine chemicals, intermediates and essential oils, several of the products being of exclusive manufacture and not produced by any other British chemical manufacturer. I was told that they are now offering terpeneless oils prepared by a new process, and thereby hope to meet the needs of users who desire products of the highest quality. The second firm mentioned (W. J. Bush and Co.) are showing various essential oils which are actually distilled in England for use as perfumery materials, and they have also a special display of such fine chemicals as vanillin, salicylic acid and cream of tartar, for which they are already well-known overseas.

Those who require solvents and plasticisers for use in the manufacture of lacquer, paint and varnish, will be advised to visit the stand of Howards and Sons, who are now producing methylcyclohexanone (Sextone B) having 100 per cent. ketone content and a much higher evaporation rate than formerly. In my opinion this is a notable achievement of chemical manufacture. At this stand I was also shown a new plasticiser for cellulose acetate—Plassitil—which is said to be a really good acetate plasticiser and one which is offered at a reasonable price; it is especially of interest because it "fills a gap" in the range of pasticisers which are already on the market. Other plasticisers—some of which have been in regular use in the cellulose lacquer industry for many years—were shown by A. Boake, Roberts and Co.

Stafford Allen and Sons, who have not been represented at the Fair for several years, are now showing a range of products, pharmaceutical preparations and essential oils being prominent. For expressed oil of almonds and apricot kernels this firm has gained a world-wide reputation. Concentrated perfumers are also exhibited, together with flavouring essences for the confectionery and mineral water trades.

As might be anticipated, Albright and Wilson, Ltd., are showing various forms of phosphorus, together with phosphoric acid (pure and technical grades) and phosphate salts. It is now 92 years since Arthur Albright founded this company, which has always made phosphorus the main feature of its activities. At last year's Fair, sodium hexametaphosphate made by this company was regarded as "product of the year" for special display on the stand occupied by the Association of British Chemical Manufacturers. This year the Association has given prominence to a product of the Dyestuffs Group of Imperial Chemical Industries—Monastral Fast Blue BS—and it is an exhibit which has been staged really to help the prospective user of this new blue pigment, the first to be discovered since ultramarine in 1826. I was, however, rather disappointed to find that the Association does not occupy a stand in a more prominent position, where it could better emphasise the importance of the chemical industry in Great Britain and lay stress on the fact that more than one hundred of the most important chemical-making firms are members of it. The A.B.C.M., as the Association is affectionately called by its members, does much good work by putting the manufacturer and the user of chemicals in touch with each other.

The already well-known "Analar" laboratory reagents were seen to be an outstanding feature on the stands occupied by The British Drug Houses, and Hopkin and Williams, Ltd. At the former stand a nessleriser for colorimetric analyses by the Lovibond tintometer method especially interested me because this instrument employs tintometer glasses as standards in place of comparison solutions. At the latter stand organic reagents for metals were the chief attraction, 28 special reagents now being available, the use of which is so admirably set out in detail in a book which is offered at the modest price of 1s. Special reagents are also featured by the General Chemical and Pharmaceutical Co., who are the makers of "Judex" laboratory reagents—which, like "Analar" reagents, are of high analytical standard.

Among other exhibits I noticed a fine display of bismuth salts for pharmacuetical use and driers for the paint industry, by Thomas Tyrer and Co.; alum and aluminium sulphate in various grades for dyeing, lake making, paper sizing, etc., by Peter Spence and Sons; hydrogen peroxide, by that very progressive company, B. Laporte, Ltd., alkaloids, iodides and bromides, and several new products by Whiffen and Sons; dyes for many industries, by Williams (Hounslow), Ltd.; and the commonly-used industrial acids by Spencer Chapman and Messel, Ltd. Several new products were introduced to me by Monsanto Chemicals, Ltd., namely, phenol of very high purity and water-white cresols, phenacetin in crystal and powder form produced for the first time in Great Britain in 1935, and cresantol germicides for glue, paper, etc.

Taken as a whole, the chemical section of the British Industries Fair shows that the chemical manufacturers of Great Britain can supply the needs of all present-day chemical-using industries and that they have great resources for meeting the special requirements of the user of chemicals. At each stand visited I found great courtesy and a general endeavour to help, and whenever a technical query was raised there was someone in attendance (or procurable) to give freely of the kind of information which makes the overseas buyer realise very truly that he will be wise to "buy British."

Some Features of the Birmingham Section

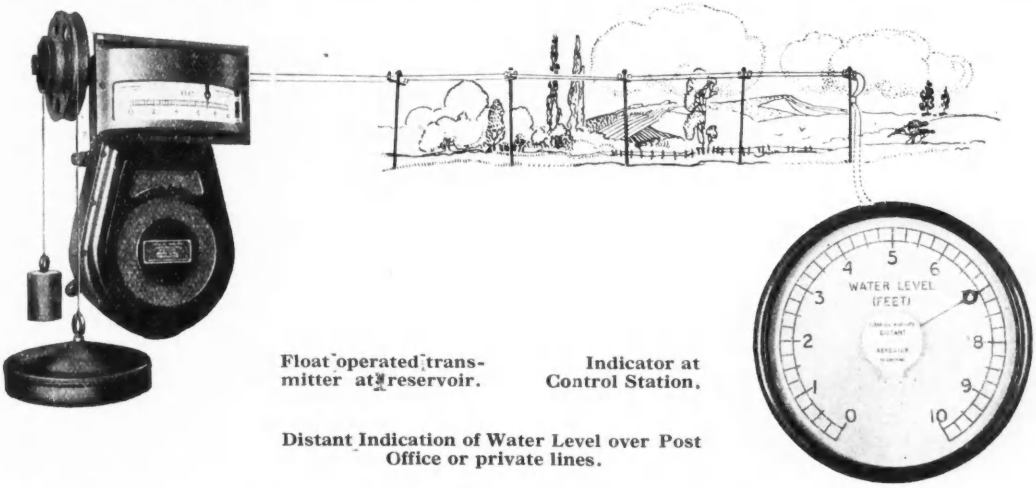
THE engineering and hardware section of the British Industries Fair at Castle Bromwich, Birmingham, which remains open until February 28, is the largest annual display of Britain's heavy industries. This section was first held in 1920, and since then no fewer than ten extensions of exhibiting area have been necessary. In 1920 the exhibits occupied 85,000 sq. ft., and this year the space let is 290,000 sq. ft., compared with 274,000 sq. ft. indoors last year. This important section of the Fair has therefore increased its exhibiting area to more than three times the exhibiting area in the year of its inception. The number of exhibitors this year is 1,003, among whom are a certain number directly or indirectly serving the chemical and allied industries.

The exhibit of Cellactite and British Uralite, Ltd. (Stand Ca 705), features Urastone flue pipes and fittings, and Cellactite asbestos protected metal roofing and roof ventilators in an attractive display. Exhibited for the first time is "New Urastone," embodying the improvements wanted in modern asbestos-cement gas flues. This new product is $33\frac{1}{3}$ per cent. lighter than formerly; it will stand satisfactorily in temperatures up to 1,000° C.

Various samples of high-grade refractory bricks and blocks, suitable for withstanding high temperature in retort settings, coke ovens, iron and steelworks, etc., are displayed by the Stourbridge Refractories Co., Ltd. (Stand Ca 815 and 714). In addition, there is a range of special refractory insulating

bricks displayed, together with special hot patching cements, both in the dry form and plastic, and samples of jointing mixtures for fireclay and silica work.

Evershed and Vignoles, Ltd. (Stand Cb 309), have in recent years specialised in apparatus for distant indication and control, and the centre of their stand is occupied by a typical control panel carrying indicating and recording instruments operated by various methods of distant indication which this company have at their disposal. These methods include the Midworth distant repeater (illustrated), the C and S No-contact system and the new Evershed-Midworth telemeter. The choice of the system to be employed in any given instance depends on the nature of the problem under consideration. For example, the Evershed-Midworth distant repeater would be used for the repetition of electrical quantities, steam pressures, steam and water flow, and of any angular movement where the operating forces are of necessity weak. On the other hand, for the indication of water levels, position of valves and similar mechanisms, under such severe conditions as exist in sewerage schemes, the C and S System which has no moving contacts is particularly suitable.



Float operated transmitter at reservoir.

Indicator at Control Station.

Distant Indication of Water Level over Post Office or private lines.

An automatic weighing, blending and mixing unit is shown in operation on Stand D 611, occupied by Henry Simon, Ltd. This exhibit demonstrates representative Simon apparatus for proportioning, mixing, controlling and capacity-recording non-free-running materials, and particularly cattle feeds, powders and similar materials. The exhibit includes a typical mechanically-fed " Synchroweigher " for proportioning materials by weight and percentages.

The stand of the Birmingham Battery and Metal Co., Ltd. (Stand D 707/608), is very much the same as last year, being constructed from the products of the firm. At the front of the stand are representative examples of the company's production of large seamless copper and brass tubes from 6 in. to 18 in. inside diameter, as are supplied for steam pipes and other engineering purposes as well as for rollers in the paper and textile trades.

The Atlas Preservative Co., Ltd. (Stand D 723), exhibits mechanical models, test plates, etc., designed to demonstrate the elasticity and durability of " Atlas Ruskilla " iron and steel paint.

" Selek " metal-to-metal jointing material in powder form, which forms a non-oxidising and non-rusting joint, and is guaranteed to keep tight under the most exacting jointing conditions, with steam, super-heat, water, gas, alcohol, spirits, etc., is exhibited by Grant and West, Ltd. (Stand Ca 807/706 and D 206).

The exhibit of The Chesterfield Tube Co., Ltd. (Stand D 709/610), consists of cold drawn weldless steel steam pipes for high-pressure steam installations, weldless steel cylinders for the storage of oxygen, acetylene, hydrogen, carbon dioxide, coal gas, ammonia, etc., and weldless steel headers for boilers and superheaters. Large weldless steel gas storage cylinders measuring over 20 in. diameter, and solid drawn tubes manufactured from the latest corrosion and heat-resisting alloy steels are also displayed.

A complete range of Gargoyle greases for all purposes is displayed by the Vacuum Oil Co., Ltd. (Stand D 427). These are manufactured at the company's grease works at Birkenhead, claimed to be the largest and most up to date in the world.

A wide range of electric furnaces of various types is shown by Wild-Barfield Electric Furnaces, Ltd. (Stand Cb 209 and 108). Three vertical furnaces with forced air circulation are equipped with the Wild-Barfield patented centrifugal fan and combined charge progress recorder and automatic temperature controller, are widely used for a variety of low-temperature heat-treatments, such as tempering, secondary hardening on high-speed steel, and other treatments of both ferrous and non-ferrous materials.

Babcock and Wilcox, Ltd. (Stand D 501/400), are again occupying a large island site as in previous years, and their exhibits exemplify various welding processes which are used in their works. A new pipework exhibit has been built to show their " Sealweld " joint, in which the joint is made metal to metal between flanges, after which the thin projecting lips on the end of the flanges on the pipes themselves are welded together.

At Stand Cb 605/504, occupied by the British Thomson-Houston Co., Ltd., the BTH Thyratron control equipment for electric welding, constitutes a development of great importance to the electric welding industry. Its use eliminates moving mechanical parts, while in conjunction with a suitable resistance welding machine it permits the welding of special alloys, coated steels and fine gauge materials hitherto thought impracticable; also, the production speed of welding mild steel can be increased. The panel is shown applied to a welding equipment, and is complete with transformer and oil switch.

Meldrums, Ltd. (Stand D 325/224), are showing their famous mechanical stoker. The model exhibited being the coking type of stoker for a Lancashire boiler fitted with self-cleaning grate of their boxbar type. It is arranged for natural draught, but is readily adaptable for forced draught by means of steam jets or fan. A new type of dust and spark collector for boilers and incinerators is also exhibited, the dust being automatically discharged into a closed container, so that gases freed from dust pass up the stack.

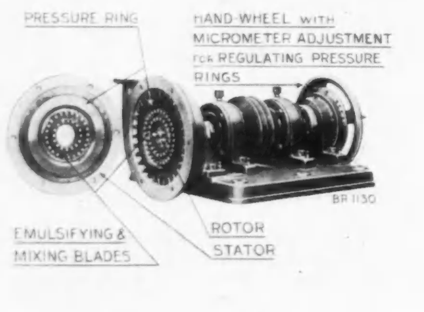
An all-purpose jointing, suitable for every kind of joint—steam, water, gas, oil—is shown by Thomas and Bishop, Ltd. (Stand D 323/222), together with belt dressings, tinning compounds, and asbestos furnace cement. The latter material is useful for repairing furnaces and for stopping air leaks around boilers and flues.

Besides a demonstration plant for spraying paints, celluloses and enamels, the Midland Fan Co., Ltd. (Stand A 722), are exhibiting two or three types of fume removing fans, suitable for use in chemical works. They have a propeller fan arranged with a totally-enclosed motor driving a propeller blade on an extended arm, so arranged that the blade can revolve in a duct, whilst the motor and bearings are outside the range of the acid or other fumes.

Gibbons (Dudley), Ltd. (Stand No. Ca 613) are showing a full range of high-class refractory materials for all purposes. In addition to bricks and special shapes in fireclay and high alumina materials, furnace engineers in particular will be interested in the range of super refractories of carborundum, fused alumina and sillimanite; also in the Gibbons H.T.1 refractory insulating brick. The latter, which has only recently been introduced, has a heat conductivity five times less than that of firebrick, and may be used without deterioration at temperatures up to 1,350° C.

Samuel Fox and Co., Ltd. (Stands D.613/714) manufacture a wide range of alloy steels; a series of the most recently produced is shown. They include "Diamet" inspected steels which are made by the high-frequency electric steel melting process, and subjected to a very rigid system of inspection at every stage of manufacture.

A comprehensive range of exhibits in Firth-Vickers stainless and "Staybrite" steels at Stands D 513/412 occupied by Firth-Vickers Stainless Steels, Ltd., illustrate the diverse and ever-increasing application of non-corrodible and heat-resisting steels for industrial purposes. Space is devoted to the use of "Staybrite" steel for the chemical, brewing, dairy and textile industries.



British Rema High Speed Emulsifier.

I.C.I. (Metals), Ltd., who have recently acquired the manufacturing rights of "Everdur," a copper-manganese-silicon alloy which has met with great success in the United States, will be showing this alloy on Stand D 503/402. This alloy is non-corrosive and almost as strong as steel. The display will show the different forms in which it is sold.

Work done with the aid of B.O.C. welding equipment is exhibited by the British Oxygen Co., Ltd. (Stand D 511/410). The applications of oxy-acetylene welding in the brewing, food, and chemical trades demonstrate the welding of non-ferrous metals, *e.g.*, copper, aluminium-bronze, stainless steels, and monel metal. A section of the stand shows the spraying of metals with the metal spraying pistol. This process is extensively used for applying protective coatings of metals, *e.g.*, aluminium, bronze, copper, steel, and zinc, etc., to metallic and non-metallic surfaces.

The British Rema Manufacturing Co., Ltd., are exhibiting (Stand D 903/802) a pneumatic drier which will be demonstrated periodically on the drying of small slack coal. Among other exhibits is a ball mill with classifier and heavy duty fan, a disintegrator with pneumatic handling plant, a high efficiency unit air separator (demonstrations being given to show the high grade of product obtainable when classifying such materials as hydrated lime, silica, barytes, etc.), a paddle type mixer for powders, and a batch type wet mixer and emulsifier.

Wellington Tube Works, Ltd. (Stand Ca 400) have a display of mild steel and wrought iron tubes and fittings for gas, water, steam, etc., also special pipework of every description. "Weldex" air heaters, manufactured by the subsidiary firm, The Victoria Tube Co., Ltd., are also shown, a prominent display consisting of the range of "Weldex" unit heaters, demonstrating the all-welded method of construction.

The most interesting exhibit by W. and T. Avery, Ltd. (Stand D 613/512) is an industrial visible weigher with weigh-record indicator. This machine, in addition to giving visible indications of exact weight up to high capacities, also prints an accurate record of every load passing over the machine, either on a ticket or a continuous tape, or upon both a ticket and a tape.

The Dunlop Rubber Company's range of anti-corrosion rubber is a feature of their Stand D 609. Protective linings for acid-resisting containers of all types, and Nerflex buckets and jugs for corrosive liquids are among the many interesting products on view.

James Gordon and Co., Ltd. (Stand Cb 710 and 811) are showing a comprehensive range of regulators, relays, etc., used in connection with the Hagan system of automatic boiler control; also "Simplex" and "Duplex" Mono combustion recorders, the "Duplex" instrument registering unburnt combustible gases (if present) in addition to the CO_2, and thus providing a complete guide to combustion conditions.

Guest, Keen and Nettlefolds, Ltd. (Stand B 606) are showing screws, bolts, rivets, washers, etc. Samples will be shown of the products of their Darlaston bolt and nut works, and their associated company, John Garrington and Sons, Ltd.

Woven wire in all meshes, metals and gauges of wire, and wedge wire in various metals and apertures, showing all types of wedge sections, are shown by N. Greening and Sons, Ltd. (Stand Cb 803). Perforated plates in all metals, showing a wide variety of perforations, are also shown, as well as a new type of vibratory screen.

Part of the stand D 413 and 314 occupied by Henry Wiggin and Co., Ltd., is devoted to exhibits relating to a few chosen industries, particularly those in which resistance to corrosion, cleanliness and high mechanical properties are required. A pickling crate of Monel metal is an interesting example of an important application.

David Moseley and Sons, Ltd. (Stand D 719) are exhibiting a very comprehensive range of mechanical rubber and vulcanite products for all industrial purposes, including hose, flooring, tubing, gloves, and mechanical moulded rubber products, including anti-corrosive goods for use in the chemical industries.

A striking display of anti-corrosive and protective materials is shown by Robert Bowran and Co. (1934), Ltd., Newcastle-on-Tyne, on Stand B 718. Actual films of the "Bowranite" paints are exhibited on metal panels, and a series of interesting photographs shows the important jobs recently protected by these paints.

A selection of fusion welded work, including a water tube boiler drum and stainless steel vessels, is exhibited by John Thompson (Wolverhampton), Ltd. (Stand D 907). At this stand Kennicott water softening plant is also shown.

Tubes ranging from ⅛ inch to 54 inches bore are exhibited by Stewarts and Lloyds, Ltd. (Stand D 601/500). Exhibits include screwed and socketed gas, water and steam tubes, black and galvanised, steel pipes for gas, water and sewage mains and distribution systems, oil pipes and casing, high-pressure steam pipes, boiler tubes, etc. The variety of joints available comprises spigot and socket, welded and fixed or loose flange types, Victaulic joints and Johnson couplings. Of particular interest is the Dawson joint; this all-welded joint is exhibited in "with flanges" and the "without flanges" types.

Protection Against Toxic Gases

Important Investigations Now in Progress

Mr. J. Davidson Pratt, O.B.E., General Manager and Secretary of the Association of British Chemical Manufacturers.

MR. J. DAVIDSON PRATT, general manager of the Association of British Chemical Manufacturers, read a paper on "Protection Against Toxic Gases in Industry," at a meeting of the South-Eastern Counties section of the Institute of Chemistry in London on Wednesday evening, and described investigations at present being conducted by the Chemical Defence Research Department under the auspices of the Department of Scientific and Industrial Research on behalf of the Home Office and the Association of British Chemical Manufacturers.

The primary consideration for protecting the worker against gassing risks, said Mr. Pratt, is to take every precaution against the escape of the dangerous material into the atmosphere and especially into that of the workroom. The use of automatic or totally-enclosed plant and machinery will in many cases achieve the desired object, and too much attention cannot be given to the design of the plant to ensure that there will be no escape of dangerous gas into the workroom, not only when the plant is operating satisfactorily but also, if possible, in the case of breakdown. This should be regarded as the basic method of ensuring safety for the workers.

Need for Adequate Ventilation

Where conditions of working make it impossible to achieve this ideal, then adequate ventilation should be provided, and this should be designed so as to carry the dangerous vapours away from the workers. In general, this is best achieved by means of exhaust ventilation, and the ventilating arrangements should be constructed so as to draw off the fumes as near as possible to the point of liberation, so that they do not get into the air of the room; coupled with this it is good policy to supply the workrooms with clean conditioned air at a suitable temperature. There are very few cases indeed where it is not possible, by proper attention to the design of the plant and the ventilation, to provide complete protection for the operatives.

Where particularly noxious substances have to be handled, efficient protection may be secured by enclosing the plant, or at least the section of it from which fumes may be evolved, in a close-fitting cabinet connected to an efficient exhaust ventilation, the exhaust being discharged at a safe place outside the building, either with or without intermediate treatment to destroy any noxious material in the exhausted air. The sides of the cabinet can be provided with large windows of reinforced glass, while all control valves, recording instruments, etc., can be installed on the outside walls, so that the operation of the plant can be observed and controlled from the outside, thus eliminating the dangers of gassing. This method is used in some factories where phosgene is handled, *e.g.*, in dyemaking, and has been applied with complete success in connection with chemical warfare agents of great potency such as mustard gas and the arsenicals. In these cases the saving in casualties and illness has repaid the extra cost many times over.

Protective Devices

If these precautions are observed there should be no need for the workers to wear protective devices such as respirators and dust pads for their normal duties. There are, however, a few isolated cases, chiefly with dusts, where it has so far proved impossible to prevent the contamination of the atmosphere, and in such cases protective devices such as dust filters may have to be worn continuously to protect the breathing passages. These are the exception, however, and respirators and similar appliances should invariably be regarded solely as emergency methods of dealing with dangerous situations, for example, rescuing a man from a poisonous atmosphere. It may be suggested that this appears to discount the value of respirators, but such is not the intention. The best designs of gas mask, and there have been great improvements of late years, impose a certain amount of handicap on the worker and definitely detract from his comfort. Therefore unless the most rigid discipline is observed, men will discard the respirators and endeavour to work without them, with, in many cases, serious results.

Safety depends on a full knowledge of the nature and properties of the substances used or produced at every stage of manufacture and of the reactions involved. In this connection the importance of impurities in the raw materials and of the by-products in the reactions must always be borne in mind, as they are very often the cause of trouble. For example, arsenic as an impurity in sulphuric acid has been responsible for many gassings with arsine in storage tanks.

Hazards in New Processes

The model safety rules issued by the Association of British Chemical Manufacturers state that before commencing any new manufacture the employer should take steps to ascertain definitely whether there are any special dangers attaching to the operations involved, and whether the substances used, or made at any stage, possess any properties which necessitate precautions being taken for the protection of the workers. The design of the buildings and plant should be based on the information thus obtained, and appropriate rules framed for the observance of workers in the process. While the principle underlying this rule appears obvious, many accidents have occurred in the past through neglect of the measures suggested.

During the research and the semi-technical scale development leading up to bulk production, a special study should be made of the materials used or produced, and of the processes, at every stage, from the point of view of explosibility, inflammability, poisonous or deleterious properties, and of the conditions which may lead to uncontrolled reactions and consequent dangers. The possibility of substituting non-dangerous for dangerous reagents should always be carefully considered, for example, in the case of solvents, non-inflammable or non-toxic liquids may, in view of the reduced fire or gassing risk, prove less costly in the long run than inflammable or toxic liquids, even though their actual cost may be higher or their efficiency lower. Special experiments will in most cases have to be undertaken to obtain the whole of this information.

Attention must always be paid to the effects which may be produced on the worker by prolonged contact with the sub-

stances used, or by the prolonged inhalation of contaminated air, even when such contact or contamination may be slight, for example, with lead, arsenic compounds, aniline, nitrochloro-benzole, and similar bodies. Many poisons, such as compounds of arsenic and lead, have a cumulative effect, which will only become apparent after months or even years of working. Tests on animals, if suitably arranged, should provide indications as to whether such cumulative effects are likely to occur. In all cases where there is any suspicion that prolonged contact or exposure may cause injury, steps should be taken in designing and operating the plant, fully to safeguard the workers. A committee of the Medical Research Council is now making a study of the physiological properties of the solvents in common use in industry, as a result of the unfortunate experiences with dioxan.

Detection of Toxic Gases

Referring to the investigations being conducted by the Chemical Defence Research Department, Mr. Pratt said the Association was paying one half of the cost and the Government the other. This problem related to the detection of toxic gases encountered in industry. Undertaken primarily in the interests of the safety of workers in the chemical industry, its results would be applicable to any other industry in which the gases in question were encountered, and there were few industries which did not have to contend with one or more of them. It was deemed desirable to undertake an investigation with a view to finding simple chemical tests which could be easily applied for the toxic gases most commonly encountered in the cleaning of plant and vessels. It was decided that tests should be worked out for sulphuretted hydrogen, arseniuretted hydrogen (arsine), sulphur dioxide, nitrous fumes, organic halogen compounds, such as trichlorethylene and chlorbenzene, aniline, prussic acid, chlorine, carbon disulphide, carbon monoxide, phosgene, benzene and nitrobenzene.

The work, said Mr. Pratt, has been in progress over two years and is nearing completion. As each test is finished by the Department, firms in the chemical industry are asked to experiment with it under practical conditions to see if it is satisfactory and, in particular, to determine whether other gases which may be present do, or do not, vitiate the results. Ultimately the detailed tests will be published, each as a separate memorandum, and they will be described in sufficient detail to enable any competent chemist to carry them out. The memorandum on each test will also include information regarding the conditions under which the particular gases are likely to be encountered, their physiological properties, and the first aid measures to be taken in the event of gassing.

Maximum Allowable Concentration

For each gas, it is necessary to determine the maximum allowable concentration into which an unprotected man can safely go without receiving any injury of any sort, whether immediate or delayed. This at once raises the question of the period of exposure. It has been decided in consultation with the Factory Department that the maximum period shall be taken as six hours, which is considered to be the longest duration of a piece of work, whether of inspection or repair in the contaminated atmosphere. Therefore the tests to be of any value must be capable of detecting with certainty the presence of the maximum concentration which a man can breathe with safety for six hours continuously. If it can detect still lower concentrations so much the better. No man should be allowed to go into a closed vessel or confined space containing a concentration of the toxic agent in excess of the six hours' maximum safe concentration. Either the vessel should be further cleaned or ventilated to reduce the concentration to a safe level, or the man should be protected by suitable breathing apparatus.

An endeavour has been made to make the tests quantitative as well as qualitative, and where possible test papers which change colour on contact with the gas have been developed, the depth of the stain or colour change giving a reliable indication of the concentration. It has been shown that the mere exposure or the waving of a test paper impregnated with suitable chemicals in the atmosphere under test is quite unsatisfactory, and the only reliable method is to draw a definite quantity of the atmosphere through a standard area of the test paper. In this way a set of standard stains corresponding with different concentrations of the gas can be prepared.

Standard Tests

By comparing with the standards the stain obtained under similar conditions with the atmosphere under test, the concentration of the gas in the atmosphere in question can be fairly accurately determined, and a decision reached as to whether it is safe for an unprotected man. The standard stains appear to be capable of reproduction in fast colours which, with reasonable care, should last for at least several months. In a number of cases, stains on paper cannot be arranged and the comparison is done in solution. All that the chemist has to do is to fix up the test apparatus which will be of a simple type and will be standardised, draw a definite volume of the air through the test paper using, where necessary, a long piece of rubber or glass tubing to get the sample from the contaminated place, and compare the colour on the test paper with the set of standards. In this way a test can be done in a few minutes. Even if the atmosphere of a vessel is safe at the onset, it will often be desirable to repeat the test during the progress of the work to ensure that the atmosphere has not become unsafe from gas liberated from sludge, crevices and the like. All existing methods for detecting the gases have been fully examined and the methods now advocated are regarded as being the most suitable for the object in view.

Mr. Pratt, in conclusion, said the dangers of gassing were due primarily to the properties of matter and its transformations. It was therefore a subject of special interest to the chemist. The chemist must, of course, co-operate with the physiologist or the pharmacologist in order to determine just what were the toxic properties of the various products. Having secured that information, the safety of the operatives lay largely in the chemists' hands. He must study carefully all the processes of manufacture and must know exactly where danger was likely to arise and its precise nature, not only when the plant was working to schedule, but also when things went wrong. He must always bear in mind that the real danger might arise not from the main products handled, but from impurities, from by-products or from the materials used in nearby processes.

Institution of Chemical Engineers

Fourteenth Annual Meeting

THE Institution of Chemical Engineers has this week issued the detailed programme of its fourteenth annual meeting, to be held at the Hotel Victoria, Northumberland Avenue, London, on March 6. The business session will be held at 11 a.m., and at this meeting the Osborne Reynolds, Moulton and William Macnab Medals will be presented. Dr. Herbert Levinstein will deliver his presidential address at 11.45 a.m., taking as his subject "The Grant of Trading Monopolies—Then and Now." Following an informal luncheon in the hotel restaurant, a paper will be presented at 2.15 p.m. by M. Novomeysky on "The Dead Sea—A Storehouse of Chemicals." The paper will comprise a résumé of the geographical, mineralogical and climatic conditions peculiar to the Dead Sea and will discuss small scale work relating to the crystallisation and recovery of the salts found there. A brief outline will be given of the developments in hand by which the ultimate production of 100,000 tons per annum of potassium chloride will be attained. The paper will be followed by a discussion.

Owing to the death of King George V the annual dinner, which was to have been held on the same date, has been postponed to a date to be announced later.

Lithopone and Zinc Sulphide Pigments

Their Outstanding Characteristics for Paint Manufacture

SOME characteristics of lithopone and other zinc sulphide pigments were described by Dr. H. Mills, M.Sc., in a paper read before the Manchester Section of the Oil and Colour Chemists' Association on January 10.

The name of "lithopone," said Dr. Mills, should be confined, strictly speakinv, to the equi-molecular mixture of zinc sulphide and barium sulphate, but one quite commonly hears the term "high strength lithopone" used for mixtures containing more than about 30 per cent. zinc sulphide. The generic term, however, is possibly permissible because the steps involved in the manufacturing processes are practically identical whatever the percentage sulphide aimed at. These steps are tabulated below:—

Zinc Flow.

ZnS (blende)
↓ Roast
ZnO
↓ H_2SO_4
$ZnSO_4$ (including other sulphates)
↓ Zn dust
$ZnSO_4$ (free from heavy metals)
↓ oxidation and neutralisation
$ZnSO_4$ (liquor pure)

Barium Flow.

$BaSO_4$ (barytes)
↓ Coal
BaS ("black" ash)
↓ H_2O
$Ba(SH)_2 + Ba(OH)_2$ (in solution)
An alkaline sulphide solution which after clarification is barium sulphide liquor pure.

$ZnSO_4$ + BaS
↓
$ZnS + BaSO_4$ (both insoluble)
↓
"Slip" filter dried
↓
"Crude" Lithopone.

Developing Pigmentary Properties

Crude lithopone has no marked pigmentary properties; to develop these it must be heated to, and mantained at, an optimum temperature for a regulated period terminated by sudden quenching in water. After wet grinding, filtering, drying, and dry grinding, the product is finally ready for use. If in the zinc flow the sulphuric acid is replaced by hydrochloric, the resulting "crude" is pure zinc sulphide, since barium chloride is soluble, and by a proper combination of chloride and sulphate any desired mixture of zinc sulphide and barium sulphate may be obtained. Other methods of precipitation are at present being developed, the most notable being that used for pure and high strength sulphide pigments.

Zinc sulphide pigments are definitely non-toxic; they are harmless both during manufacture and in use. Stringent purity is essential during manufacture to maintain their whiteness and brightness. After calcination they are neutral and for all practical purposes inert; they will then resist all organic and inorganic reagents except concentrated mineral acids. In density they vary from 4.0 for pure sulphide and 4.45 for barium sulphate. The refractive indices vary from 2.37 to 1.64: the true lithopone averaging 1.84.

In the past the resistance of lithopone to active rays depended closely on their freedom from traces of certain undesirable radicles, notably chlorides; at present, any lithopone may be made light fast by the addition of minute amounts of various metals, the most useful of which is cobalt. This metal present to the extent of 0.015 per cent. of the zinc content will confer stability. The fact that such a small amount is effective conveys some indication of the purity of lithopones as commercially prepared. Such a trace is without sensible effect on any property other than light-fastness. There are, however, many grades of lithopone of satisfactory light-fastness without this treatment; the treatment is meritorious in that it has extended the utility of a range of lithopones of low oil absorption previously unsuitable for many purposes because o ftheir poor light resisting qualities.

Strength of Zinc Sulphide Pigments

It is usual to convey to users an indication of pigmentary value by a comparative statement of hiding or obliterating power and of reducing power or tinting strength. The following table gives figures for the commercially common white pigments, but since there is no absolute standard for reducing power it has been based, as is usual, on 100 for white lead, and a similar comparison has been made in the case of hiding power.

Pigment.	Quantity Used. (sq. ft./lb.)	Hiding Power. (W.L.= 100)	Reducing Power. (W.L. = 100)
White lead	15	100	100
Pure zinc sulphide	55	367	540
60% zinc sulphide	36	240	450
Lithopone (28-30%)	24	160	280
Antimony oxide	27	180	360
Titanium dioxide	72	480	1050
Zinc oxide	22	147	200

In presenting these figures, Dr. Mills pointed out that, although H.P. and R.P. do increase together, no obvious relationship exists between them. For example, although lithopone and titanium dioxide have respectively about 2.8 and 10.5 times the reducing power of white lead, the comparative hiding powers are only 1.6 and 4.8 white lead. The Paint Research Station have also found it necessary to draw attention to this point, for the two terms are measures of two important and independent properties of white pigments—namely, power to obliterate or hide a given surface and power to reduce or weaken the tint exhibited by a particular coloured material. If the paintmaker is making a white paint he is concerned largely with H.P. and that is what he should measure; if he is making a coloured paint he is also concerned with the proportion of white to mix with his stain to produce the necessary tint. Nevertheless, in literature obviously concerned only with white paints it is not unusual to find R.P. cited as a measure of the pigment strength. It seems that the colour maker might conceivably deem it an advantage, in some cases, to have as low a R.P. as possible in his white, providing the H.P. remained of the required order, for then his final colour would contain a relatively high proportion of white pigment with consequent influence on service and costs.

Sulphide Content of Lithopones

Attention has frequently been drawn to the apparent discrepancy between the sulphide content of various grades of lithopones and their pigmentary strength. The explanation has long held ground that lithopone owes its peculiar position to the co-precipitation of zinc sulphide and barium sulphate whereby the sulphide more or less effectively coats the sulphate so that the pigment has, to all intents, a surface of zinc sulphide. This has recently been supported by experiments on heat of immersion of pigments in oil, and by ultra-violet transmission micro-graphs of lithopone dispersions in a suitable media. Crystallographic examination by X-ray methods fails to support this view; the sulphate and sulphide apparently exist in separate entities, physical properties, *e.g.*, density,.and more particularly refractive index, are generally the additive result of the two pure constituents.

Whatever controversy does exist upon the subject of the constitution of lithopone is based on apparently enhanced pigmentary values for lithopone, which can be explained without resource to arguments based on the spatial distribution of its constituents. When the advantage of lithopone over,

say, pure sulphide, is commented upon, the tacit assumption made is that in these pigments zinc sulphide alone accounts for the pigmentary value, whilst the blanc fixe is merely a diluent. This, however, is hardly a fair view of the part played by barium sulphate. Mechanical mixtures fall very little short of the commercial co-precipitated products. What deficiency there is, is not due to any constitutional advantage in co-precipitation, but to the difficulty of developing the fullest pigmentary value during the manufacture of zinc sulphide.

Zinc Sulphide Pigments in Paint

The measurable physical properties of these pigments—density and refractive index, reducing and hiding power—are all more or less definitely measurable and the paintmaker should have no difficulty in finding, on the zinc sulphide range from lithopone to pure sulphide, a pigment to meet his requirements in these respects. If one of the three normal commercial grades does not meet his specification he can safely use a mechanically mixed pigment without any great fall off in relative strength. Such mechanical mixtures appear to be quite as satisfactory in use as co-precipitated pigments; this is, of course, a matter of observation—there must be very few paints made in which the pigment is not a mechanical mixture. Apart from these easily measurable properties there are other characteristics probably much more important, but much more difficult to define. Such items as speed of wetting with oil; pigment-vehicle relationships; oil absorption and so on are extremely important in different manufacturers' products, and even in any one manufacturer's products.

Surface properties are without doubt of fundamental importance in deciding pigment-vehicle relationship, and when considering these pigments from this angle it is essential fully to appreciate the nature of the zinc sulphide-barium sulphate complex. Of the various whites, the zinc sulphide pigments are the only group initially prepared as a result of ionic precipitation. Zinc oxide and antimony oxide are sublimated; white lead may best be described as the result of a solid gaseous reaction; titanium oxide results essentially from the controlled hydrolysis of titanous salts. Lithopones—using this as a generic term—are distinctly colloidal when precipitated; they show the drying and swelling phenomena usually associated with gels and they display strong adsorption characteristics. Although these characteristics are considerably modified during subsequent processing, particularly by the heat treatment, they are never completely destroyed. Indeed, it is the manufacturer's job to turn them to the best advantage.

Control of Properties

Lithopones from the furnace, said Dr. Mills, are chemically inert and neutral (*p*H approximately 6), but by judicious control at all stages they may be produced with any desired *p*H and with oil absorption varying from 12 to 23 per cent., with a similar variation for other vehicles. Again, although lithopones do not react chemically with paint media unless they contain an undue amount of zinc oxide—which normally should not be present more than 0.2 to 0.3 per cent.—a controlled degree of chemical activity may be given to the surface by taking advantage of adsorption in the distribution of traces of extraneous materials of the desired character. Without making any such additions it is possible during the manufacture to control such properties as particle size and surface condition, so that the behaviour of the same chemical product in paint manufacture may be quite appreciably varied. For example, two products of the same *p*H and oil absorption may show, according to the methods adapted in manufacture, quite different rates of wetting with oil or even differences in behaviour in the can. An appreciable degree of tendency to display thixotropy may be imparted, so that a paint quite fluid on working may " body up " on standing and again become fluid on agitation. The vehicle used is equally important in its influence on such phenomena.

As an outside paint pigment lithopone, including the higher strength pigments, are best formulated with other pigments of *proved reliability*. The principal defect of *white* lithopone paints for outside use is chalking, associated with cracking and loss of adherance. Chalking, or disintegration of the surface film, is, to some extent, typical of all white pigments, and is due, so it has been suggested, to the transparency of these pigments to short light waves. Coloured pigments are not so subject to chalking because colours, except blue, absorb short rays. Zinc oxide absorbs these rays so that the general trend is to use mixtures of lithopone and zinc oxide 10-40 per cent. oxide, and these have met with considerable success.

Zinc sulphide pigments are compatible with other whites—titanium dioxide, white lead, and timonox. It is fair to say that with these, weathering properties of the resulting mixtures are more or less intermediate in character between the two components, but that with oxide the weathering is increased more than proportionately because of the opacity of the ZnO to short wave lengths. It is an advantage to mix with the lithopones a second white pigment which will toughen the paint film, increase the elasticity and generally counteract those physical properties of lithopone films which lead to cracking. Leaded zinc oxide is much esteemed for this purpose; if, however, it is desired to keep entirely clear of lead, non-leaded zinc oxide will be found to give excellent results.

The Value of Pre-Treatment

Recently attention has been called to the benefits resulting from pre-treatment of the vehicles used in paint mixing, the general tendency being towards the use of more highly bodied oils with a consequent toughening of the paint film. It is now general to include a proportion of stand oil in linseed oil vehicles, as the advantages of this are apparent. The amount of stand oil which may be added is, of course, limited by the brushability of the paint, but for normal pigmentation up to 20 per cent. of the oil may be stand oil. The extender will also be found to exert considerable influence on the service characteristics of lithopones. The well-known 40-40-20 formula may be varied considerably on the inert. Recent work has shown the importance of particle size and shape in weathering characteristics, particularly in hindering checking and cracking.

It is evident that the formulation of paints based on the lithopone or zinc sulphide pigments offers a very wide field for experiment and research. The normal lithopones are by now pretty well known and the capabilities and limitations fairly thoroughly appreciated. When compared with the older white pigments their hiding power is considerable.

High Hiding-Power Pigments

Recent developments have focused attention on high hiding pigments, and in this class pure zinc sulphide is well to the fore. In pure sulphide and the intermediate strength lithopones the paintmaker has at his disposal pigments generally behaving similarly to normal lithopone with the added advantage of high strength pigmentary properties. These new pigments are valuable for use with expenders other than blanc fixe, and pure sulphide may be mixed with such extenders and show pigmentary values similar to the co-precipitated lithopone. This should give confidence to the paintmaker in trying formulation on extenders other than blanc fixe.

No considerable amount of extenders may be added to normal lithopone (28-30 per cent.) without seriously diminishing its hiding power, but with the higher sulphide contents paints may be formulated with other extenders and yet remain within the desired covering range. As the density of the available extenders covers a fairly wide range, mixtures of similar zinc content may have quite different bulking values. For example, a 50 per cent. zinc sulphide-barium sulphate has a density of approximately 4.2; the corresponding calcium mixture is approximately 3.2 with a slightly higher hiding power.

Four Types of Evaporating Plant

Their Operating Principles and Advantages

THE necessity for close co-operation between chemist and engineer in designing evaporating plant is becoming greater now that an increasing number of applications are being found in the chemical industry, with attendant difficulties which have to be overcome.

In evaporator design the characteristics of the solutions to be handled have to be carefully studied, and since the physical and chemical characteristics of modern trade liquors are of such a wide variety there is necessarily a large number of different types of evaporators to be found on the market.

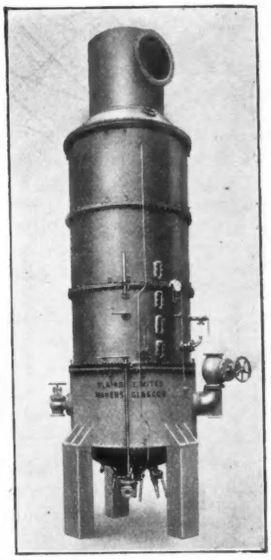


Fig. 1.—A Typical Single Effect Evaporator manufactured by Blairs, Ltd.

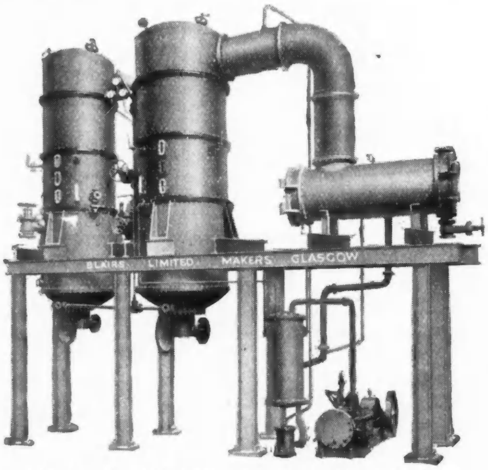


Fig 2.—Double Effect Evaporator of Special Design for treating liquors of delicate nature.

Some liquors have to be produced with a high degree of concentration, others again require only a small quantity of water to be removed; in some cases the viscosity of the liquor is greatly increased during evaporation, while in others a definite saturation point is reached, after which the salts either partially or completely precipitate out during concentration. The boiling point of the liquor may be so high as to necessitate a high steam pressure to effect the evaporation, or, on the other hand, it may be harmful to expose the liquor to a temperature beyond a certain limit in which case the evaporation must be carried out under a high vacuum and low pressure steam. All these factors must be taken into account when considering the most suitable type of evaporator to deal with any particular liquor.

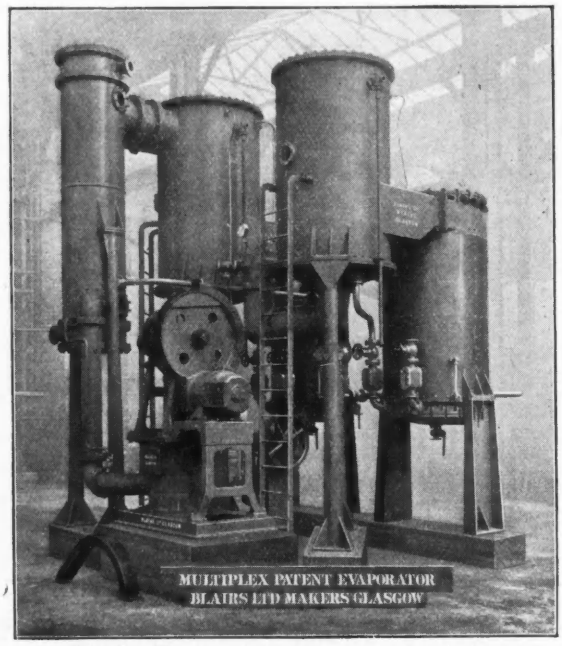


Fig. 3.—The very latest in evaporator design.

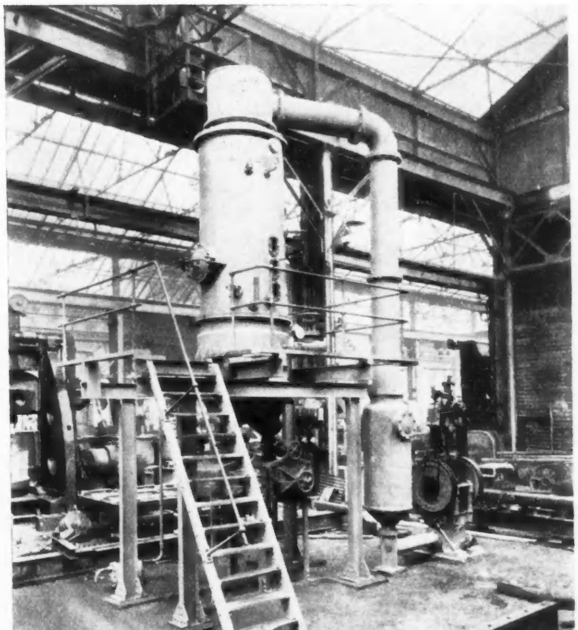


Fig. 4.—Blairs' Single Effect Salting Type Evaporator.

A typical single effect evaporator, manufactured by Blairs, Ltd., is shown in Fig. 1. This evaporator is arranged for evaporating the liquor in bulk, under vacuum, and discharging the concentrated material intermittently in batches. The lower portions form the steam space in which the heating tubes are arranged, and this is surmounted by a body of ample depth to allow for the foaming of the liquor. A special baffling arrangement is fitted at the top of the evaporator,

which prevents any of the liquor being carried over with the vapour to the condenser.

The double effect evaporator (Fig. 2), also manufactured by Blairs, Ltd., is of a special design for treating liquors of delicate nature which deteriorate on being exposed to the heating surfaces for any length of time. A special type of circulator is embodied in the lower part of the vessels, which assists the circulation of the liquid through the heating tubes.

An evaporator known as the improved Multiplex patent film evaporator (Fig. 3) has been developed by Blairs, Ltd., during the last few years, and many modifications and improvements in design have been made to meet the requirements of the chemical and allied industries. In this type of evaporator the vapours, on leaving the first heating chamber, are passed tangentially into the separator where, by the rapid centrifugal action produced in the separator, the heavier particles of liquor collect at the bottom and flow into the heating chambers. The vapour is then passed into the second heating chamber where it is used to effect the evaporation of the liquor in this chamber and so on.

Balanced Vacuums

The vacuums in the various vessels are suitably balanced and maintained, in order that the necessary difference in temperature exists between the vapour and liquor to effect the most economical conditions of evaporation. The number of such stages of evaporation, or effects, which may be employed is governed by various factors, such as the nature of the solution to be dealt with, steam conditions and degree of concentration required, and each individual evaporator problem requires to be closely studied so that the most suitable plant may be designed. A special feature of the Multiplex evaporator is that the heating tubes through which the liquor passes may be easily cleaned with a minimum of labour. Evaporators working on this principle enable a considerable saving, both in steam and condensing water requirements, to be effected, compared with the consumptions when single effect evaporation is employed.

The Latest in Evaporator Design

The evaporator shown in Fig. 3 represents the very latest in evaporator design and works at very much lower temperatures than exist in ordinary vacuum evaporators. The extremely low temperatures allow of the evaporation in multiple effect of certain solutions which, on account of their tendency to deteriorate with high temperatures, had hitherto to be evaported less economically in single effect evaporators.

Blairs' single effect salting type evaporator (Fig. 4) has been designed for dealing with liquor containing soluble salts which precipitate out during concentration, such as electrolytic caustic soda, magnesium sulphate, soap-makers' spent lye and sulphate of ammonia. Here the arrangement of the heating tubes and downtake is such that a perfect circulation takes place, ensuring that every part of the evaporator is kept free of crystals, except in the cone shaped bottoms from which they are discharged into receivers, closed salt filters or removed continuously by means of elevators. These evaporators are eminently suitable for evaporating dual salt solutions when arranged in double effect, the more soluble salt being precipitated in the first effect and the less soluble one after further evaporation in the second effect. The crystals produced are of a very fine nature.

Silicon Iron Alloys for Chemical Plant

A Lecture by Mr. S. J. Tungay

INFORMATION on the use and application of silicon iron alloys for chemical plant construction was given by Mr. S. J. Tungay, of Haughton's Metallic Co., Ltd., in a lecture delivered at the Sir John Cass Technical Institute, London, on January 29.

Previous to 1914, said Mr. Tungay, the metallurgy of the various acid-resisting irons appeared to have commanded the interest of comparatively few persons in this country and America, although it must be confessed that much attention was being concentrated on the study of such alloys on the Continent. The ferro-silicon alloys for acid resisting and for use in chemical plant usually consist of an alloy of from 13.5 per cent. of silicon, up to 17 per cent. silicon, with a pure iron as free as possible from carbon, manganese or other ingredients which may be considered impurities. It has been found that with a lesser or even a higher percentage of silicon than the portions named, an immediate falling off of the acid-resisting property of the metal is experienced. Therefore it will be observed that the alloy must be maintained within very definite limits.

With an alloy containing 15 per cent. silicon, some exceptional properties of acid resistance are obtained, as will be observed from the following corrosion tests :—

Acid.	Initial weight. Grams.	Loss after boiling at 150°C. for 24 hrs.	48 hrs.	72 hrs.
Sulphuric acid 65% ..	112.648	Nil	Nil	Nil
Sulphuric acid 20% ..	115.207	Nil	Nil	Nil
Nitric acid 90%	13.392	0.011	0.038	0.074
Nitric acid 30%	116.629	0.013	0.016	0.016
Acetic acid	115.475	Nil	Nil	Nil
Chromic acid 10% ..	115.264	0.547	0.631	0.670
Tartaric acid 25% ..	117.428	0.028	0.101	0.154
Oxalic acid 25%	117.867	0.041	0.061	0.091
Ammonium chloride 20%	120.257	Nil	Nil	Nil

This table shows tests carried out for varying periods to demonstrate the resistance of ferro-silicon alloy, and it will be observed that the greatest commercial application of these alloys is manifest in connection with resistance to sulphuric and nitric acids; although for many other acids they withstand more satisfactorily than other metals and alloys.

It is difficult to over-estimate the enormous value of acid-resisting iron to the chemical industry as a material for the construction of apparatus and plant for industrial purposes. The shortcomings of the various materials to which the chemical manufacturer and chemical engineer were formerly tied, such as pottery, glass, quartz and metals of a more or less corrodible nature, have long been recognised, and the chemical industry has now more fully appreciated the great superiority of ferro-silicon or acid-resisting cast iron for dealing with acids and corrosive liquors. Continued research and experiment has made it possible to deal with these difficult alloys in such a way as to ensure greater stability, improve the tensile strength and render castings, vessels and parts homogenous—the manufacture of which some 10 or 12 years ago would have been considered utterly impossible.

It is in connection with the heavy chemical industry that the widest application of acid-resisting iron has been attainable, as the metal stands up excellently against sulphuric acid and nitric acid at varying densities and at all temperatures. Therefore, as a medium for constructing plant in connection with the manufacture of sulphuric and nitric acids, as well as apparatus and equipment where the utilisation of either or both of these acids is a necessity, "Ironac" acid-resisting iron is now very extensively used. In connection with the industrial utilisation of both sulphuric and nitric acids, a large variety of apparatus has been manufactured, including many forms of retorts, pans, vessels, jacketed pans, autoclaves, sulphonating and nitrating apparatus and other vessels, especially suitable for containing these corrosive acids, either in a hot or cold condition.

Patents as Industrial Property

Some Anomalies Discussed at Manchester

A JOINT meeting of the Manchester Sections of the Society of Chemical Industry, the Institution of the Rubber Industry, and the Institute of Chemistry, was held at Manchester on February 7, when Mr. W. A. Silvester, M.Sc., of the Dyestuffs Group, Imperial Chemical Industries, Ltd., gave an address on "Patents as Industrial Property." Mr. A. McCulloch, M.Sc., presided.

The understanding behind all developed patent laws, said Mr. Silvester, is that an inventor is a public benefactor and may accordingly be given a monopoly in exploiting his invention for a limited period of time in return for his teaching the public what his invention is by means of a document, with or without drawings, and at the same time saying clearly what it is that the public is barred from doing for the period of time provided. Thus an inventor who becomes also a patentee is a potential or actual industrial property owner. If the invention is technically fruitful, the fruits are his for a number of years.

World Monopoly Impossible

Patents, however, are granted by governments, and hold good only in the territory of the particular government. By patents one cannot obtain a world monopoly, as about one-third of the world's population of 1,850 millions dwells in areas where there are no patent laws or almost none. These areas are perhaps at present (except China) negligible from a manufacturing if not from a sales point of view, and it might be enough for anyone to patent only where manufacturing competition is expected. But a patenting campaign is necessarily planned early in technical development, as in most countries that grant patents (the United States is an exception) the first applicant, if there is competition in patenting, gets the patent. The patenting campaign, then, is carried forward at a time when sales expectations may be vague, and money short, even in a firm. Considered also from this point of view it is reasonable to limit the field for patenting to particular countries. When a detailed lay-out is made, it is seen that patent expenses alone vary enormously from country to country. Thus, reckoning in both initial expenses and renewal fees, the cost in £ of patenting per million of population is approximately as follows: United States, 0.15; Britain, 3.0; Australia, 10.0; Irish Free State, 37.0; Japan, 0.7; Germany, 6.0; Austria, 30.0, and so on. There are no renewal fees in the United States and Canada. In other countries the older the patent the higher the fee. Tactical considerations in competitive industry become complicated if dud patents do not die early.

Some Continental Differences

Passing on to chemical patenting, and restricting his observations to France, Britain, Germany, and the United States, Mr. Silvester discussed the inventor's procedure in obtaining a patent, and emphasised the details of the differences between the laws and practices of these four countries. France is one of the countries where patents are given almost for the asking, that is, there is no novelty search by the Patent Office and no provision for precise claiming. The French patentee then has no guarantee whatever that his patent is valid; he has little more than an official certificate that at a given time he had made what he thought was an invention. Also in France a new chemical product can be patented as such. Britain goes some steps further, and grants patents after a novelty search of, even now, a limited kind, carried out on the principles of elementary logic without overmuch regard for facts. Chemical patenting in Britain must be by processes. Britain also provides an opposition procedure; but in its opposition a measuring stick of inventiveness cannot easily be applied. Hence a British patent is not necessarily of any more value than a French patent.

In Germany, where chemical patenting is again limited to processes, the official novelty search and the opposition procedure both allow of argument of over "technical effect," that is, a measuring stick of inventiveness, easily grasped by the technician, may be applied. The system in the United States is peculiar and complicated. Chemical products may be claimed as such. There is a strict and wide novelty search as in Germany, but on paper only. There is no provision for opposition. Conflicting applications fall into "interference"—a peculiar procedure, by which it may be the later applicant is shown to be the first inventor, often seemingly ended by agreement to licence or cross-licence (not an affair for the Patent Office). In short, it may be said that, so far as obtaining patents goes, the law and practice most readily to be understood by the technologist is probably that of Germany, despite some failings; and German practice gives patents most of which carry the best presumption of validity.

Litigation in the High Court, as over infringement or revocation, being expensive, creating and retaining of property by patents in competitive industry is a different affair in different countries. It is most likely to be free from preliminary encumbrances in Germany. Britain and the United States are perhaps about on a level, and circumstances are perhaps most difficult in France. There are many other points of difference between different countries' patent laws. The anomalies within the British Empire are noteworthy.

In competitive industry the inventor may readily find himself "dominated," that is, an earlier patent still in force covers an earlier stage in a process than that to which his invention relates. Also there is chemical generic term domination. The circumstances here are such that the would-be manufacturer must make his own arrangements with the earlier patentee; the Patent Offices do not help, but the patent laws may.

Madagascar Clove Oil Industry

Rapid Increase in Exports

THE clove oil produced in Madagascar is obtained mainly from clove leaves, and only to a small extent from the stems, the buds not being distilled. The industry was started in 1911 and the exports up to 1932 were increased from 1,450 kilos in 1913 to 135,460 kilos in 1932. The usual charge of a 1,000 litres still is 280 to 300 kilos of leaves, the distillation of which takes 20 to 24 hours, with a yield of 5 to 5½ litres of oil per charge. Stills are owned by Europeans, Creole planters and natives. In the Soanierana district some stills are owned by a European trading firm and leased to the natives who pay in oil on a basis of local ruling price. Stills are also run on a co-operative basis.

Leaves are obtained by topping about 3 ft. of the tree, large trees yielding up to 100 kilos of twigs and leaves, with the average for trees over 20 years old, about 50 kilos and trees under 20 years old 25 kilos. The twigs and leaves are left under the tree for a couple of days to dry, and then placed in the still without stripping. The topping process is increasing and causing serious damage to the future crops of cloves. In Sainte Marie the dry fallen leaves also are gathered for distilling.

The oil is transported in large glass demijohns and exported in tinned iron drums. There is a 5 per cent. *ad valorem* export duty. The 1932 exports and countries of destination were: France 123 tons, United States eight tons, England three tons, and Germany one ton. The total export value was 2,700,000 francs. The quality of the oil seemed satisfactory though there is no standardisation or inspection in Madagascar. Good Soanierana oil is reputed to contain 85 per cent. eugenol.

British Overseas Chemical Trade in January

According to the Board of Trade returns for the month ended January 31, 1936, exports of chemicals, drugs, dyes and colours were valued at £1,725,010, as compared with £1,877,556 for January 1935, a decrease of £152,546. Imports were valued at £1,007,187, as compared with £902,139. Re-exports were valued at £26,801.

Imports

	Quantities. January 31, 1935.	Quantities. January 31, 1936.	Value. January 31, 1935. £	Value. January 31, 1936. £
Acids—				
Acetic .. .. cwt.	12,967	14,695	20,068	19,032
Boric (boracic) .. ,,	7,182	2,840	6,963	2,979
Citric .. .. ,,	1,999	3,411	6,578	12,104
Tartaric .. ,,	1,298	2,718	5,563	10,787
All other sorts .. value	—	—	9,178	10,848
Borax .. .. cwt.	17,584	17,100	8,393	10,408
Calcium carbide .. ,,	88,787	73,731	50,958	46,085
Fertilisers, manufactured—				
Superphosphate of lime tons	4,185	2,953	7,623	5,413
All other descriptions ,,	3,017	1,672	14,729	7,046
Phosphorus .. cwt.	—	4	—	34
Potassium compounds—				
Caustic and lyes cwt.	11,120	11,658	13,490	13,671
Chloride (muriate) ,,	49,453	33,039	15,566	11,061
Kainite and other mineral potassium fertiliser salts .. cwt.	84,105	77,970	11,057	11,535
Nitrate (saltpetre) ,,	18,615	19,364	8,049	9,454
Suplhate .. ,,	36,374	30,360	12,753	13,404
All other compounds ,,	9,218	11,518	16,671	18,868
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	14,592	—	3,525	—
Chromate and bichromate .. .. cwt.	6,433	1,274	8,502	1,709
Cyanide .. ,,	3,957	3,579	9,835	9,056
Nitrate .. .. ,,	159,762	172,000	37,888	34,276
All other compounds ,,	19,463	28,079	16,751	20,864
Other chemical manufactures .. .. value	—	—	210,871	235,318
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	70,326	209,655	5,981	15,275
Medicinal oils .. cwt.	3,160	3,812	7,181	12,318
Proprietary medicines value	—	—	42,722	66,388
All other sorts .. ,,	—	—	55,018	40,907
Dyes and dyestuffs and extracts for dyeing and tanning—				
Finished dyestuffs (coal tar) .. .. cwt.	2,968	3,232	88,269	91,123
Extracts for dyeing ,,	2,626	5,042	6,201	9,580
Chestnut extract ,,	32,723	41,452	22,727	29,526
Quebracho extract ,,	17,782	38,161	10,283	31,140
All other sorts .. ,,	29,481	42,230	18,755	30,053
All other dyes and dyestuffs .. .. cwt.	1,062	1,238	14,197	21,180
Painters' and printers' colours and materials—				
White lead, basic carbonate .. cwt.	6,290	6,385	7,126	7,954
Lithopone .. ,,	14,711	22,338	9,840	14,676
Ochres and earth colours cwt.	27,990	59,813	9,971	17,736
Bronze powder .. ,,	1,953	1,915	13,592	13,435
Carbon blacks .. ,,	41,645	47,605	61,631	66,153
Other pigments and extenders, dry .. cwt.	31,025	33,304	8,225	10,512
All other descriptions ,,	11,542	12,591	25,409	25,279
Total .. .. value	—	—	902,139	1,007,187

Exports

	Quantities. January 31, 1935.	Quantities. January 31, 1936.	Value. January 31, 1935. £	Value. January 31, 1936. £
Acids—				
Citric .. .. cwt.	3,312	2,595	11,550	10,609
All other sorts .. value	—	—	25,438	20,208
Aluminium compounds tons	1,618	1,319	16,720	8,859
Ammonium compounds—				
Sulphate .. tons	25,807	26,871	139,720	159,789
All other sorts .. ,,	2,062	1,787	23,467	16,843
Bleaching powder (chloride of lime) .. .. cwt.	55,136	36,546	14,363	10,108
Coal tar products—				
Cresylic acid .. gal.	147,774	158,261	12,781	15,290
Tar oil, creosote oil, anthracene oil, etc. gal.	4,400,674	2,670,576	91,746	63,390
All other sorts .. value	—	—	12,040	20,382
Copper, sulphate of tons	1,964	452	25,782	6,395
Disinfectants, insecticides, etc. .. .. cwt.	29,749	26,433	60,364	57,793
Fertilisers, manufactured tons	14,665	22,640	72,788	88,649
Glycerine .. .. cwt.	19,797	8,731	45,372	21,406
Lead compounds .. ,,	10,209	11,860	12,446	15,545
Magnesium compounds tons	463	465	10,402	10,941
Potassium compounds cwt.	4,665	3,784	11,894	8,044
Salt (sodium chloride) tons	23,756	22,171	58,298	60,286
Sodium compounds—				
Carbonate, including crystals, ash and bicarbonate .. cwt.	462,768	292,088	117,258	71,862
Caustic .. .. ,,	211,416	172,433	111,663	83,688
Nitrate .. .. ,,	12,950	17,048	4,370	5,382
Sulphate, including salt cake .. .. cwt.	29,275	42,954	5,736	3,914
All other sorts .. ,,	55,113	59,385	73,398	76,341
Zinc oxide .. .. tons	1,033	898	18,492	17,625
All other descriptions value	—	—	196,875	191,572
Drugs, medicines, etc.—				
Quinine and quinine salts .. .. oz.	210,183	150,776	21,636	14,755
Proprietary medicines value	—	—	114,840	96,062
All other descriptions ,,	—	—	133,231	139,937
Dyes and dyestuffs and extracts for dyeing and tanning—				
Finished dyestuffs (coal tar)—alizarine, alizarine red and indigo (synthetic) .. cwt.	1,192	2,288	5,865	15,019
Other sorts .. ,,	7,569	7,300	105,789	99,127
All other descriptions ,,	37,242	20,056	36,399	35,993
Total of dyes and dyestuffs,etc. .. cwt.	46,003	29,644	148,053	150,139
Painters' and printers' colours and materials—				
Ochres and earth colours cwt.	12,905	16,852	15,888	16,328
Other pigments and extenders, dry .. cwt.	16,310	15,209	29,328	27,153
White lead .. ,,	5,351	6,283	9,954	12,722
Paints and enamels, prepared .. .. cwt.	39,530	34,308	102,819	96,992
Varnish and lacquer (clear) .. gal.	83,233	66,405	32,596	27,097
Printers' ink .. cwt.	4,482	4,494	27,275	28,330
All other descriptions ,,	33,739	35,553	68,973	70,574
Total .. .. value	—	—	1,877,556	1,725,010

Re-Exports

	Quantities. January 31, 1935.	Quantities. January 31, 1936.	Value. January 31, 1935. £	Value. January 31, 1936. £
Chemical manufactures and products .. value	—	—	19,725	15,665
Drugs, medicines and medicinal preparations value	—	—	9,963	8,604
Dyes and dyestuffs and extracts for dyeing and tanning .. .. cwt.	401	1,344	1,239	1,653
Painters' and printers' and materials .. cwt.	263	468	744	879
Total .. .. value	—	—	31,671	26,801

The Five Day Week in Industry

Points For and Against Its Adoption

As reported in THE CHEMICAL AGE last week (pages 141-142) Mr. B. A. Bull, production director of Boots Pure Drug Co., Ltd., opened a discussion on the five-day week in industry at the annual dinner of the British Chemical Plant Manufacturers' Association in London on February 6. The five-day week was introduced at Boots' factories at Nottingham in 1934 and has proved successful from every point of view.

Lord LEVERHULME said Lever Brothers had followed the example of Boots in their factories in this country by introducing, from January 1, the five-day week, and in the case of shop workers whose hours were formerly 48 they had reduced the number of hours to 44. It was too early yet to pass any judgment on the scheme. When they introduced it they sent particulars to the president of their American company who, in reply, reminded them that in their factories in the United States they were already working on the basis of a 35-hour week.

Two Schools of Thought

There were two schools of thought—the school which believed that we must go in for national and international planning if we were to solve our industrial problems, and the school, probably considered old-fashioned, which believed that if only things were left alone they would, by the operation of the law of supply and demand, work themselves out, and that it was our interference with those laws which had caused all our present difficulties. The trouble arose from international rivalry and from the fact that in the operation of those natural laws there must be a time lag which brought hardships. As things were, we must seek to minimise those hardships by assisting unemployment, and thereby perhaps unconsciously promoting it, in order to make the sufferings as light as possible.

Mr. E. WALLACE, chairman of the Association of British Chemical Manufacturers, in thanking Mr. Bull for his address, said he was in favour of the five-day week. In his company, however, he knew two people who worked more than five days a week; one was the chairman and the other was himself.

Colonel E. BRIGGS (Lever Brothers, Ltd.) said they must not only reduce the working hours and so provide additional employment, but they must make sure that the workers employed their leisure time to advantage. There were industries where the wage cost was not an appreciable proportion of the total cost of the product, and there the five-day week might be quite easily applied, but it might be quite impossible in those cases where the wage cost was an appreciable proportion of the total cost of the article that was being produced, and that was where the importance of the consumer came in. They were all servants of the consumer and they must give him what he wanted, at the lowest possible cost.

The Working Man's Primary Need

His company was led to introduce the five-day week from several motives. In certain factories they were already working five days a week on the basis of the 48-hour week, and the workers were suffering on account of reduced wages. It was felt that the one thing the working man to-day wanted was some security in his employment and a knowledge of what he was going to take home at the end of the week, and that was the basis of their scheme. The basis was not really to reduce the working week from 5½ days to five, but to guarantee a minimum wage to everybody.

Mr. B. L. BROADBENT, while agreeing that there were many industries in which the five-day week could be worked successfully, said there were also many in which it was impracticable, for instance, the engineering side employed in the maintenance and repair of plant. The engineering staff would take full advantage of the Saturday and Sunday to keep the plant in order for the 40 or 44-hour week. As a manufacturer of chemical plant, it had been his experience in the north that it was difficult to find skilled operatives, and this trouble would be aggravated by the general application of the five-day week. There was also the question of the office staff dealing with air mail correspondence which necessitated attention on Saturday mornings.

Mr. J. ARTHUR REAVELL agreed with Mr. Broadbent that it would be difficult to adopt the five-day week in the chemical plant manufacturing industry owing to the demand for the manufacture of special articles and the proportionately small amount of repetition work that was called for. The manufacturer of a particular product wanted entirely different plant from that required by another manufacturer of the same product owing to the fact that they did not use the same raw material. Mr. Reavell concluded by saying that it might be an ideal arrangement to close all day for golf on Saturday and for church-going on Sunday, provided everybody did the same.

Mr. BULL briefly replied to the discussion and was heartily thanked for introducing the subject.

The "Fused" Collar

A Novel Use for Cellulose Acetate Rayon

AT the present time there is being awakened an increasing interest in a process for making permanently stiffened fabrics, especially those suitable for the manufacture of men's collars. This process utilises the plastic properties of cellulose acetate rayon and has originated in the United States ("Textile World," May, 1935, p. 1059). The process consists of placing a fabric (containing a certain proportion of cellulose acetate rayon threads) between two cotton fabrics, then applying a solvent capable of softening the rayon, and afterwards subjecting the composite fabric to a suitable degree of heat and pressure. The acetate rayon thereby becomes plastic and forms an intimate bond between the two cotton outer fabrics. The resulting fabric is stiff (according to the amount of acetate rayon present) and it retains its shape, size and stiffness even after repeated washing. Obviously, such a fabric has many uses in addition to its use for uncreasable and unshrinkable men's collars.

Many solvents can be employed for making the acetate rayon plastic, and among these are acetone, alcohol, methyl ethyl acetone, and acetic acid. The choice of solvent is not only governed by its effect on the cellulose acetate rayon, but also on any colours which may be present in the fabrics being bonded together. Manufacturers of the new collars have encountered fabrics whose colours have bled under the action of the solvent; careful selection of the solvent is thus necessary. Another point which has required much attention is the proportion of acetate rayon which must be present. If too little is present, the bonding of the fabrics is deficient and lacks permanency, but if too much is used the cellulose acetate oozes through the outer fabrics to give the collar a glassy celluloid appearance which is far from pleasing.

THE manufacture of synthetic resin articles, such as soap boxes, shaving bowls, cups, cigarette boxes, electric wall switches, etc., is being attempted in India by two small factories. One is known as the Bestolite Manufacturing Co., located in the Bombay Presidency, and has been operating for more than a year. The other, which was inaugurated in Calcutta last April, is known as the India Moulding Co.

Chemical Plant Construction by Welding

Its Many Advantages

APART from the usual physical factors which enter into the design and construction of plant and machinery, such as wear, strains, strength and weight, the chemical plant engineer has the factor of corrosion to contend with. Coincident with this problem he has also the added task of preventing contamination in the case of machinery for fine chemicals, foods, beverages and other liquids where a high standard of purity is essential.

In so far as these latter problems are influenced by the actual producing plant or machinery he must of necessity be circumspect in the choice of materials for the plant and in the determination of the methods to be adopted in their construction. Moreover, although in all probability there are never two jobs alike which leave his shops, his prices have to be strictly competitive.

By the use of welding in construction, his design can be best suited to his clients' requirements. The use of castings which was obligatory in the days when the welding processes were not known, enforced a time production schedule which was difficult to reduce. It also enforced a weight which was not always necessary. By fabricating plant in his own works, progress can be followed daily. As practice indicates, adjustment and alteration can be made and construction proceeds to a culmination wherein a design is achieved having an effective balance of strength and weight.

Conical Vacuum Still Body of Welded Copper.

The almost undetectable homogeneous joint made by welding takes little time and expenditure of energy as compared with the cumbersome methods of the riveter and the blacksmith, excellent though they may be in certain spheres. With a heat given off by a flame having a temperature of 3,500° C., the welder has at his command a more flexible and swifter aid than any Vulcan had. This power may be set to work anywhere, for a welding plant is portable. The method of jointing thus provided obviously has no truck with friction or corrosion and, consequently, of contamination. A welded plant, internally and externally, is made for its work as any creation of nature.

In welded chemical plant, liquids or solids are not impeded by unnecessary obstructions thus tending to reduce coagulation and cohesion. There are no points for corrosion to set in, and the simplicity of the construction facilitates cleaning and maintenance. Welded construction, moreover, does not require the elaborate preparations and plant necessary for its prototypes. The engineer can weld all metals with an "Alda" high-pressure plant, as supplied by The British Oxygen Co., Ltd., and has a new power at his disposal which widens the scope of his work.

The accompanying illustration shows a typical welded copper job. It is a conical vacuum still body, suitable for working under a full vacuum at a temperature of 250° C., the still being heated with a gas furnace. The bottom of the still is dished and is $\frac{3}{8}$ inch thick whilst the conical side is $\frac{1}{4}$ inch thick. The head of the still is bolted to the body by the usual form of joint rings. The thermometer pockets and other fittings attached to the apparatus are welded into place as also is the neck piece for the manhole door shown on the side of the conical body; the overall height of the apparatus exceeds 6 ft.

Chemical Matters in Parliament

Palestine Potash

IN the House of Commons on Tuesday Mr. R. Beaumont asked the Secretary of State for the Colonies whether he had any information as to an agreement proposed between the Palestine Potash Co. and the German Kali Syndicate; and if he could state what were the terms of the agreement and what stage the present negotiations had reached.

Mr. J. H. Thomas replied that he had seen the draft of an agreement which was submitted to the Palestine and Trans-Jordan Governments for approval, as well as to himself. He was not aware whether the agreement had yet been signed. He was not in a position to state its terms.

Mr. R. Beaumont asked what was the present amount of potash produced by the Palestine Potash Co., and what was its selling price.

Mr. Thomas said he would ascertain from the company whether it could furnish the desired information.

Letter to the Editor

Warning to Inventors at the B.I.F

SIR,—The opening of the British Industries Fair at which the Institute of Patentees, by arrangement with the Department of Overseas Trade, offers advice to exhibitors in all matters relating to patent rights in relation to the Fair, prompts me to repeat a warning to exhibitors who may not be fully cognisant of the patent laws. An exhibitor who is displaying a device not yet protected must, if he wishes fully to safeguard his rights, notify the Comptroller of Patents on the prescribed form of his intention to do so.

This step is, however, a very preliminary one, and it cannot be too strongly emphasised that it does not prevent piracy by a foreigner, who may copy the invention in detail, apply for a patent in another country and proceed to exploit it before the inventor has applied for protection. The originator of an idea is tempting providence in revealing it unprotected in an exhibition of such wide international scope as the British Industries Fair.—Yours faithfully,

G. DRURY COLEMAN,
General Secretary.

The Institute of Patentees,
10 Victoria Street, S.W.1.

AS in former years, the bulk of Germany's alcohol for 1935, approximately 2,433,220 hectolitres, was produced from potatoes. Other sources included molasses, 148,053 hectolitres; yeast, 288,547; other agricultural materials, 57,994; and as an industrial by-product, 549,460 hectolitres.

Personal Notes

MR. W. W. COOPER has been appointed a director of the British Oil and Cake Mills, Ltd.

COLONEL SIR JOHN J. SHUTE, M.P. for the Exchange Division of Liverpool, contributes an interesting article on "Industrial Relationships" to the latest number of "Nuts," the house magazine of J. Bibby and Sons, Ltd., Liverpool.

MR. B. J. CAFFERATA and MR. C. F. CAFFERATA have been co-opted as directors to the board of British Plaster Board, Ltd.

MR. E. V. APPLETON, Wheatstone Professor of Physics in the University of London and former Fellow of St. John's College, Cambridge, has been elected by the Council of the Senate of Cambridge University into the Jacksonian Professorship of National Philosophy at Cambridge from October 1.

MR. HUMPHREY F. ALLAN, who for many years was cashier with the Aberdeen Lime Co., has died at his home at Aberdeen, at the age of 81. He entered the employment of the Aberdeen Lime Co. when he was 13 years of age and retired about 15 years ago.

MR. RICHARD E. SIBBALD, well known throughout the dyestuffs and chemical trades in Scotland as Scottish manager for I. G. Dyestuffs, Ltd., died on Tuesday. Mr. Sibbald was 62 years old and had been in the dyestuffs trade for 40 years. Before the war he was in the Glasgow office of Bayer and Co., and during hostilities he carried on business on his own behalf, resuming after the war as the Scottish importer for the German firm.

PROFESSOR F. M. ROWE, of the Department of Colour Chemistry and Dyeing at Leeds University, gave a lecture on "The Azoic Dyes" at a meeting of the Midlands Section of the Society of Dyers and Colourists on February 18, at the Derby Technical College. He reviewed the chemistry of the bases and members of the Naphtol AS series, now on the market, from the point of view of the constitution, colour and fastness properties of the derived Azoic dyes. This was followed by a review of the work that the lecturer and his research students have done during the past ten years on the effects of hot after-treatments on Azoic colours.

MR. F. R. MARKS and MR. C. J. OPPENHEIM have joined the board of Coal and Allied Industries, Ltd.

DR. CHARLES DREYFUS, of Mentone, France, formerly managing director of the Clayton Aniline Company, and a Manchester city councillor, left £8,429, with net personalty £1,986.

MR. E. G. BROWNBILL has been elected president of the Seed, Oil, Cake, and General Produce Association for the ensuing year. Mr. Brownbill, who is a J.P. and member of the Mersey Docks and Harbour Board, is senior partner in E. Brownbill and Son.

SIR F. GOWLAND HOPKINS, Professor of Biochemistry at the University of Cambridge, has been appointed to the faculty of Harvard University for the academic year beginning in September. He will deliver a series of lectures in the medical school as the Edward K. Dunham Lecturer.

MR. WALTER E. EVISON, until recently a research student at University College, Nottingham, has been awarded the Ph.D. of the University of London. He is now employed by Imperial Chemical Industries, Ltd., in directing and supervising the manufacture of synthetic dyestuffs.

MR. THOMAS L. HOLLELY, of Retford, has died after a short illness, at the age of 68. Mr. Hollely had been chairman of the Retford Gas Committee and a member of the National Joint Industrial Council of the Gas Industry. He was one of the best known figures in the public life of North Notts.

MR. JAMES L. BIGGART, chemical manufacturer, Paisley, who resided at Westhaven, Troon, left £89,133. He bequeathed £3,000 to the Biggart Memorial Home, Prestwick, with which he had been closely identified during his life-time, and £1,000 to the Biggart Trust.

MR. O. M. HAYDEN, of du Pont de Nemours and Co., of America, and a member of the executive council of the American Chemical Society, will address the Institution of the Rubber Industry at the British Empire Club, St. James's Square, S.W., on Monday, on "Duprene: its Applications in Industry." There will be an informal dinner to welcome Mr. Hayden.

Continental Chemical Notes

Poland

THE "STREM" CHEMICAL CO., of Warsaw, will shortly take up the manufacture of bone oil and horn oil, the domestic demand for which is estimated at 5 to 7 tons per month.

Austria

RECENT COMPANY REGISTRATIONS include: Grimm and Teusch, Vienna 1 (technical and cosmetic chemicals); Heinrich and Viktor Frenkel, Vienna 16 (polishes, paints, and lacquers).

France

AMONG RECENT COMPANY FORMATIONS ARE the following: Chenevier, Bailly et Cie, 25 rue de l'Admiral-Mouchez, Paris; capital 500,000 francs; for industrial and commercial exploitation of chemical processes. Société Le Néo-Sucre, 14, rue Etex, Paris; capital 700,000 francs; for treatment of all products used in the manufacture of sugars.

Czechoslovakia

LEGISLATION NOW BEING DRAFTED in connection with the financing of a coal hydrogenation project in the Ostrau region will probably allow for exemption of hydrogenated spirit from all taxation for a considerable period. An estimated initial outlay of 100 million crowns will be required and the commencing output of 240,000 to 360,000 tons per annum will satisfy 10 to 15 per cent. of the domestic requirements in motor spirit.

Greenland

NEGOTIATIONS ARE IN PROGRESS to prolong the concession for exploitation of cryolite deposits granted some time ago to Kryolith Mine- og Handelsselskab A/S and it is rumoured that the State may now participate in the enterprise.

Italy

WITH A CAPITAL OF 20 MILLION LIRE, the Azienda Minerali Metallici Italiana has been registered in Rome with the declared object of prospecting for metals in Italy. The capital will be subscribed by the State, which also guarantees an annual subsidy of 1 million lire.

Russia

EXTENSIVE DEPOSITS of titanium—magnetite ores, with a small titanium but a high vanadium content, have been located in the vicinity of Pervouralsk.

SUCCESS IS CLAIMED TO HAVE ATTENDED the experimental production of pure helium from natural gases by the Gas Engineering Trust (Ssojusgas).

Sweden

LIQUID CHLORINE MANUFACTURE is shortly to be undertaken by a new department of Elektrokemiska A. B., at Bohus, where calcium chloride and other chlorine compounds have been made for the past 40 years. New plant for the manufacture of hydrogen peroxide, perborates, and persulphates has also been installed.

Chemical and Allied Stocks and Shares

There has been a fairly general upward movement in prices, and shares of companies associated with the chemical and allied trades have participated. Salt Union received increased attention on hopes of a larger dividend or possibly a share bonus. There has also been a revival of talk that the company may be concerned in a merger. United Molasses were again rather less active, but Distillers remained prominent on the view that in future the directors may decide to deal less conservatively with profits if the industrial alcohol side of the business is yielding larger earnings. Goodlass Wall have held their recent further rise, favourable dividend estimates having remained current. The belief that the company has had a good year is based largely on the view that the lead section of the business has probably benefited from the larger demand for the metal and the activity in the metal markets. Fison, Packard and Prentice continued very firm on favourable views of prospects, as fuller benefits are expected from the expansion of the business. British Oil and Cake Mills preferred ordinary were firm. United Premier Oil and Cake ordinary retained their recent gain, an increase in the dividend for the year to 12 per cent. still being thought quite likely in the market. There has been a sharp rise in Imperial Smelting. This reflects the higher price of zinc as the level of the latter plays an important part in the company's profits. Imperial Chemical remained in larger demand. Bradford Dyers have been lowered on the past year's results which were considered very disappointing in the market, although it is still expected that at the meeting the chairman will be able to indicate that the outlook for the company is improving. Courtaulds were also lower on the results, more than the maintenance of the dividend having been hoped for in the market despite the very cautious statements made at the meeting a year ago. British Celanese preference and ordinary shares were little changed. British Drug Houses continued to come in for more attention on the possibility of a larger dividend. William Blythe 3s. ordinary shares held their recent rise to around 8s. 6d. Blythe Colour Works 4s. shares, in which dealings commenced recently, were active around 11s. 6d. The price has to be read in relation to the company's good earning capacity. On the basis of last year's profits, earnings on the ordinary shares would be equivalent to over 32 per cent. Cooper McDougall and Robertson were again unchanged and have continued to be held steadily on the hope that the results, due next month, will show larger profits and an increased dividend. British Cyanides remained active although virtually unchanged on the week. Lawes Chemical have held their good rise of the previous week. Borax Consolidated kept the advance which followed the recent announcement of the doubling of the dividend to 5 per cent. Various shares which the market considers have prospects of larger dividends, and possibly share bonuses as well, were prominent, including Associated Portland Cement, Boots Pure Drug and Triplex Safety Glass. Unilever were in demand on further reports that conditions for the margarine side of the business are improving. Dorman Long issues were bought on the recent announcement of the relighting of further furnaces. British Oxygen received increased attention on the view that recent developments suggest that the business still has large scope for expansion, apart from the big demand expected for oxygen and other industrial gases for shipbuilding and other purposes. Oil shares have been less active, largely because speculative interest is centred mainly on industrial shares, but anticipations remain current that Anglo-Iranian, "Shell" and other leading oil companies are likely to be able to show very satisfactory increases in dividend for the year.

Name.	Feb. 18.	Feb. 11.
Anglo-Iranian Oil Co., Ltd. Ord.	89/4½	90/-
,, 8% Cum. Pref.	36/9	35/9
,, 9% Cum. Pref.	37/-	36/9
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½
,, 6½% Cum. Pref.	6/3	6/3
Associated Portland Cement Manufacturers, Ltd. Ord.	78/-	73/-
,, 5½% Cum. Pref.	28/-	28/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	70/7½	66/10½
Bleachers' Association, Ltd. Ord.	6/10½	7/6
,, 5½% Cum. Pref.	11/10½	13/1½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	56/9	57/-
Borax Consolidated, Ltd. Pfd. Ord. (£)	112/6	112/6
,, Defd. Ord.	23/7½	23/1½
,, 5½% Cum. Pref. (£10)	£11/17/6	£11/15/-
,, 4½% Deb. (1st Mort.) Red. (£100)	£107/10/-	£107/10/-
,, 4½% 2nd Mort. Deb. Red. (£100)	£105/10/-	£105/10/-
Bradford Dyers' Association, Ltd. Ord.	8/9	9/4½
,, 5% Cum. Pref.	11/3	13/9
,, 4% 1st Mort. Perp. Deb. (£100)	£87/10/-	£87/10/-
British Celanese, Ltd. 7% 1st Cum. Pfd.	25/-	25/-
,, 7½% Part. 2nd Cum. Pref.	22/6	22/9
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	6/3	6/3
,, 4% 1st Mort. Deb. Red. (£100)	£96	£96
British Cyanide Co., Ltd. Ord. (2/-)	4/3	3/9
British Drug Houses, Ltd. Ord.	18/1½	18/1½
,, 5% Cum. Pref.	21/10½	21/10½
British Glues and Chemicals, Ltd. Ord. (4/-)	8/1½	8/1½
,, 8% Pref. (Cum. and Part.)	28/9	28/9
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/9	48/9
,, 5½% Cum. Pref.	25/7½	25/7½
,, 4½% First Mort. Deb. Red. (£100)	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	125/-	122/6
,, 6½% Cum. Pref.	32/6	32/6
British Portland Cement Manufacturers, Ltd. Ord.	92/6	92/6
,, 6% Cum. Pref.	30/-	30/-
Bryant & May, Ltd. Pref.	66/3	66/3
Burt, Boulton & Haywood, Ltd. Ord.	20/-	20/-
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£102/10/-	£102/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	112/6	112/6
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	8/9	9/4½
,, 5% Pref. (Cum.)	14/4½	15/-
Cellulose Acetate Silk Co., Ltd. Ord.	13/5¼	14/8¼
,, Deferred (1/-)	2/4½	3/1½

Name.	Feb. 18.	Feb. 11.
Consett Iron Co., Ltd. Ord.	16/-	13/6
,, 8% Pref.	36/3	32/6
,, 6% First Deb. stock, Red. (£100)	£109/10/-	£109/10/-
Cooper, McDougal & Robertson, Ltd. Ord.	38/9	38/9
,, 7% Cum. Pref.	30/-	30/-
Courtaulds, Ltd. Ord.	56/7½	58/1½
,, 5% Cum.	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	31/10½	31/10½
,, 7½% "A" Cum. Pref.	32/6	32/6
Distillers Co., Ltd. Ord.	102/6	102/6
,, 6% Pref. Stock Cum.	32/-	32/-
Dorman Long & Co., Ltd. Ord.	28/9	26/3
,, Pref. Ord.	42/6	36/3
,, 6½% Non-Cum. 1st Pref.	25/3	23/6
,, 8% Non-Cum. 2nd Pref.	26/10½	25/-
,, 4% First Mort. Perp. Deb. (£100)	£103/10/-	£103/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£106/10/-	£106/10/-
English Velvet & Cord Dyers' Association Ltd. Ord.	4/4½	4/4½
,, 5% Cum. Pref.	7/6	7/6
,, 4% First Mort. Deb. Red. (£100)	£72/10/-	£72/10/-
Fison, Packard & Prentice, Ltd. Ord.	46/3	46/3
,, 7% Non-Cum. Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light and Coke Co.	28/-	28/-
,, 3½% Maximum Stock (£100)	£89/10/-	£89/10/-
,, 4% Consolidated Pref. Stock (£100)	£108/10/-	£108/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£92/10/-	£92/10/-
,, 5% Deb. Stock Red. (£100)	£118/10/-	£118/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£115/10/-	£115/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	15/7½	15/7½
,, 7% Prefd. Ord. (10/-)	13/9	13/9
,, 7% Cum. Pref.	30/-	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	28/9	28/9
Imperial Chemical Industries, Ltd. Ord.	39/6	38/-
,, Deferred (10/-)	9/7½	9/-
,, 7% Cum. Pref.	34/-	34/-
Imperial Smelting Corporation, Ltd. Ord.	17/9	15/6
,, 6½% Pref. (Cum.)	25/7½	25/7½
International Nickel Co. of Canada, Ltd. Cum.	$51¼	$49¾
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	112/6	112/6

Name.	Feb. 18.	Feb. 11.
Lawes Chemical Co., Ltd. Ord. (1/-)	8/9	8/9
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	33/-	33/-
,, 8% Cum. "A" Pref.	33/6	33/6
,, 20% Cum. Prefd. Ord.	80/-	80/-
,, 5% Cons. Deb. (£100)	£108/10/-	£108/10/-
,, 4% Cons. Deb. (£100)	£106/10/-	£106/10/-
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£10	£12
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-) ...	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	44/6	45/-
,, 1st Pref. 6½% Cum.	32/-	32/-
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£75	£73
Reckitt & Sons, Ltd. Ord.	120/-	118/9
,, 4½% Cum. 1st Pref.	24/4½	24/4½

Name.	Feb. 18.	Feb. 11.
Salt Union, Ltd. Ord.	50/-	50/-
,, Pref.	47/6	47/6
,, 4½% Deb. (£100)	£107/10/-	£107/10/-
South Metropolitan Gas Co. Ord. (£100) ...	£127/10/-	£132/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£105	£105
,, Perpetual 3% Deb. (£100)	£89/10/-	£89/10/-
,, 5% Red. Deb. 1950-60 (£100)...	£115/10/-	£114/10/-
Staveley Coal and Iron Co., Ltd. Ord. ...	53/9	53/9
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	89/4½	89/4½
Unilever, Ltd. Ord.	35/-	35/-
,, 7% Cum. Pref.	31/9	31/9
United Glass Bottle Manufacturers, Ltd. Ord.	44/-	42/6
,, 7½% Cum. Pref.	32/6	32/6
United Molasses Co., Ltd. Ord. (6/8)	26/3	26/3
,, 6% Cum. Pref.	26/3	26/3
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	11/9	11/9
,, 7% Cum. Pref.	25/7½	25/7½
,, 4¾% Deb. Red. (£100)	£104	£104

Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

METALLIC MAGNESIUM by thermal reduction, process for continuous production.—I. G. Farbenindustrie. Aug. 2, 1934. 21389/35.

LUBRICATING OIL.—Texaco Development Corporation. Aug. 3, 1934. 21525/35.

POLYAZO DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. July 30, 1934. 21607/35.

ASCORBIC ACIDS, manufacture.—B. Helferich. July 30, 1934. 21608/35.

CYANIC AND THIOCYANIC ESTERS and anhydrides and condensation products thereof, manufacture.—Soc. Anon. des Matieres Colorantes et Produits Chimiques de St. Denis and J. Claudin. Aug. 1, 1934. 21610/35.

ALBUMINOUS ARTIFICIAL MASSES and articles produced therefrom, manufacture and treatment.—Deutsche Hydrierwerke A.-G. July 31, 1934. 21770/35.

HYDROCYANIC ACID, manufacture.—E. I. du Pont de Nemours and Co. Aug. 2, 1934. 21861/35.

TREATMENT OF HYDROCARBON MATERIAL with light hydrocarbons. Standard Oil Development Co. Aug. 10, 1934. 18186/35.

N-SUBSTITUTED AMIDES of the pyridine carboxylic acids, process for production.—K. Fricker. Aug. 4, 1934. 18293/35.

OILS AND PARAFFIN WAX, process for manufacture.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 6, 1934. 19499/35.

HIGHER BOILING HYDROCARBONS from olefines, production.—International Hydrogenation Patents Co., Ltd. Aug. 4, 1934. 12802/35.

PROCESS FOR PRODUCING RESISTS in dyeing with ester salts of leuco vat dyestuffs.—Durand and Huguenin A.-G. Aug. 6, 1934. 21848/35.

HARDENING PHOTOGRAPHIC GELATINE EMULSIONS and gelatine solutions.—Kodak, Ltd. Aug. 4, 1934. 21899/35.

AMINO-CARBOXYLIC ACIDS, their salts, and functional derivatives, manufacture.—I. G. Farbenindustrie. Aug. 4, 1934. 22166/35.

VEGETABLE OILS, process for manufacture.—P. Ammann. Aug. 6, 1934. 22176/35.

Specifications Accepted with Date of Application

COATING AND FILLING MITERIALS.—W. W. Groves (I. G. Farbenindustrie). July 27, 1934. 441,879.

WATER-SOLUBLE MONOAZO DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., and A. H. Knight. July 27, 1934. 441,884.

BINDING AGENTS FOR ROAD SURFACES, manufacture and production.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 28, 1934. 442,080.

CELLULOSE, production.—H. Dreyfus. July 30, 1934. 442,020.

NITRODIBENZANTHRONES, manufacture and production.—I. G. Farbenindustrie. Aug. 4, 1933. 441,886.

OXYALKYLATED (β, 8 -DIOXYPROPYL)-AMINOBENZENES and the corresponding 8 -alkyl ethers, manufacture.—I. G. Farbenindustrie. Nov. 15, 1933. 442,024.

HYDROCARBON HYDROGENATION METHODS.—C. Vieu. July 30, 1934. 442,023.

CHEMICALLY-PURE STARCH and method of purification and separation of same.—Wisconsin Alumni Research Foundation. Sept. 22, 1933. 442,033.

IMPROVING MINERAL OILS, process.—Aktiebolaget Separator-Nobel. Oct. 18, 1933. 442,039.

ACETIC ANHYDRIDE, manufacture.—Consortium für Elektrochemische Industrie Ges. Nov. 28, 1933. 441,956.

SOAPS, process for manufacture.—C. Leyst-Küchenmeister. Sept. 24, 1934. 442,046.

WETTING AGENTS suitable for use in alkaline baths.—Soc. of Chemical Industry in Basle. Dec. 9, 1933. 442,047.

AZEOTROPIC DRYING OF ALCOHOLS OR KETONES, process and apparatus.—L. Mellersh-Jackson (Standard Oil Co. of California). Feb. 4, 1935. 442,051.

SYNTHETIC RESIN COMPOSITION.—S. L. M. Saunders. March 8, 1935. 442,053.

VINYL RESINS, manufacture.—Soc. Nobel Française. May 3, 1934. 442,057.

UREA-FORMALDEHYDE CONDENSATION PRODUCTS, preparation of compositions containing.—S. L. M. Saunders. March 8, 1935. 442,054.

ARTIFICIAL RESIN PLASTICISERS.—Beck, Koller and Co., Inc. May 5, 1934. 441,912.

VAT DYESTUFFS containing two thiazole rings, manufacture.—I. G. Farbenindustrie. May 9, 1934. 441,915.

VANILLIN, prepartion.—Je Mac A.-G. May 17, 1934. 442,061.

CONDENSATION PRODUCTS from primary aromatic amines and formaldehyde, manufacture.—Soc. of Chemical Industry in Basle. June 9, 1934. 441,978.

NITCODIBENZANTHRONES, manufacture and production.—I. G. Farbenindustrie. July 30, 1934. 441,919.

COLOURED COLLOID LAYERS, process for producing.—Dr. B. Gaspar. Aug. 10, 1933. 441,983.

Applications for Patents

(January 30 to February 5 inclusive.)

POLYMERISATION PRODUCTS OF 2-HALOGENBUTADIENES-1.3, manufacture.—I. G. Farbenindustrie. (Germany, Feb. 1, '35.) 3056.

HYDROGEN PEROXIDE, production. L. Mellersh-Jackson (Mathieson Alkali Works). 3546.

MONOAZO DYESTUFFS.—A. H. Knight and Imperial Chemical Industries, Ltd. 2898.

HYDROCARBON OILS, treatment.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, Oct. 8, '35.) 3555.

LIQUID HYDROCARBONS, decolourising process.—A. Roberts. 3520.

ZINC, distillation.—S. Robson. 2815.

WATER-SOLUBLE PHENOLIC DERIVATIVES.—Rohm and Haas Co. (United States, Feb. 13, '35.) 3451.

KETONES OF PYRENE SERIES, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Jan. 15.) 3359.

TITANIUM DIOXIDE, production.—Titan Co., Inc. (United States, Feb. 11, '35.) 3548.

TITANIUM COMPOUNDS, manufacture.—Titanium Pigment Co., Inc. (United States, Feb. 2, '35.) 3033.

Weekly Prices of British Chemical Products

THERE are no exceptional price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, pharmaceutical and photographic chemicals, perfumery chemicals and essential oils. In the coal tar products section the prices of solvent naphtha, 90/190, and purified naphthalene crystals have been slightly advanced, whilst in the intermediates section three grades of cresols show a slight reduction.

MANCHESTER.—Quotations are remarkably firm in pretty well every section of the Manchester market for chemical products, both in the light and heavy departments, the increased cost of coal to manufacturers being an important factor in this respect. Under the circumstances, future price changes are much more likely to be upward than downward, although there is little expectation on this market of any early movement. Trading conditions this week have been fairly satisfactory from the point of view of deliveries into consumption, and most classes of consumers are specifying for regular quantities. There is still, however, no more than a moderate flow of new business, including a few additional contract bookings. The light sections of the by-products market maintain a steady front, but in crude carbolic acid, pitch and crude tar the tendency is towards a further shading of prices.

SCOTLAND.—Business in chemicals has been very quiet during the week both for home trade and export. Prices, however, continue quite steady at about previous figures with only slight changes to report.

General Chemicals

ACETONE.—LONDON : £62 to £65 per ton; SCOTLAND : £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—40% technical, £17 15s. per ton. LONDON : Tech., 80%, £33 5s. to £35 5s. per ton; pure 80%, £35 5s. to £37 5s.; tech., 40%, £17 15s. to £19 15s.; tech., 60%, £25 15s. to £27 15s. SCOTLAND : Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER : 80%, commercial, £37 5s.; tech. glacial, £50.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND : Crystals, £28; powdered, £29.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER : 11¾d. to 1s. SCOTLAND : 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON : 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON : £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND : Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE : Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND : 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON : £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND : 98/100%, £48 to £50 ex store. MANCHESTER : £48 10s. to £54 ex store.

ACID, SULPHURIC.—SCOTLAND : 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON : 11½d., less 5%. SCOTLAND : 1s. 0½d. less 5%. MANCHESTER : 1s. per lb.

ALUM.—SCOTLAND : Lump potash, £8 10s. per ton ex store

ALUMINA SULPHATE.—LONDON : £7 10s. to £8 per ton. SCOTLAND : £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND : 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND : 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND : Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON : Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND : British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM SULPHATE.—Neutral quality, 20.6% nitrogen, £7 per ton.

ANTIMONY OXIDE.—SCOTLAND : £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6¾d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON : £15 per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND : White powdered, £23 ex wharf. MANCHESTER : White powdered Cornish, £21, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON : £10 10s. per ton. SCOTLAND : £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND : £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—5s. 3d. to 5s. 6d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4⅞d. per lb. LONDON : 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND : £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 2⅝d. per lb.; liquor, £19 10s. per ton d/d

COPPERAS (GREEN).—SCOTLAND : £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON : £3 17s. per cwt. SCOTLAND : £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON : £24 10s. per ton. SCOTLAND : 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON : White, £36 10s. per ton; brown, £1 per ton less. SCOTLAND : White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER : White, £36; brown, £35.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND : £25 to £27 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND : £39 per ton, carriage paid. LONDON : £41.

LITHOPONE.—30%, £16 to £16 10s. per ton.

MAGNESITE.—SCOTLAND : Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND : £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND : Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PHENOL.—6¾d. to 7½d. per lb. to June 30, 1936.

POTASH, CAUSTIC.—LONDON : £42 per ton. MANCHESTER : £38 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5½d. LONDON : 5d. per lb. less 5%, with discounts for contracts. SCOTLAND : 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER : 5d.

POTASSIUM CHLORATE.—LONDON : £37 to £40 per ton. SCOTLAND : 99¾/100%, powder, £37. MANCHESTER : £39.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND : Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON : 8¾d. per lb. SCOTLAND : B.P. crystals, 10d. to 10½d. MANCHESTER : B.P., 11¾d.

POTASSIUM PRUSSIATE.—LONDON : Yellow, 8½d. to 8¾d. per lb. SCOTLAND : Yellow spot, 8½d. ex store. MANCHESTER : Yellow, 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND : Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND : Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER : £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON : £21 per ton. SCOTLAND : £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND : Refined recrystallised £10 15s. ex quay or station. MANCHESTER : £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON :

4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%. £20 per ton d/d 1 cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£30 per ton. SCOTLAND: 3¾d. per lb.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.
SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.
SODIUM PERBORATE.—10%, 9¾d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.
SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.
SULPHATE OF COPPER.—Manchester: £14 15s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 5s. 1d. per lb. in 1-cwt. lots.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINZ SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—10d. to 11d. per lb.

Coal Tar Products

ACID, CRESYLIC.—99/100%, 2s. to 2s. 9d. per gal., according to specification; pale 98%, 1s. 10d. to 1s. 11d.; dark, 1s. 6d. to 1s. 7d. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s 1d.; high boiling acid, 2s. 6d. to 3s.
ACID, CARBOLIC.—Crystals, 6¾d. to 7½d. per lb.; crude, 60's, 1s. 11½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude, 2s. 1d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 5½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4½d. to 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4½d. to 4¾d.
NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 9d.; 90%, 1s. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Crude, whizzed or hot pressed, £14 10s. per ton; purified crystals, £22 to £23 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PYRIDINE.—90/140%, 5s. 3d. to 8s. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 2s. 3d. to 2s. 4d. per gal.; pure, 2s. 6d. to 2s. 7d.
XYLOL.—Commercial, 2s. 4d. per gal.; pure, 2s. 6d.
PITCH.—Medium, soft, 43s. to 45s. per ton, in bulk at makers' works. MANCHESTER: 42s. 6d. f.o.b., East Coast.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
o-CRESOL 30/31° C.—6d. per lb. in 1-ton lots.
p-CRESOL 34-5° C.—1s. 6d. per lb. in ton lots.
m-CRESOL 98/100%.—1s. 7d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton, in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per ton., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The prices have been announced for the remainder of the fertiliser year 1935/36 as follows: February, £7 3s. 6d. per ton; March to June, £7 5s., for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to former's nearest station.
CALCIUM CYANAMIDE.—Prices for the remainder of the fertiliser year 1935/36 are: February, £7 2s. 6d. per ton; March, £7 3s. 9d.; April/June, £7 5s., delivered in 4-ton lots.
NITRO-CHALK.—The price for the 1935/36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.
NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.
CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE (N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton according to anlysis, delivered in 6-ton lots to farmer's nearest station.

Wood Distillation Products

ACETATE OF LIME.—Brown, £7 15s. to £8 15s. per ton; grey, £10 10s. to £11. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £11.
CHARCOAL.—£4 15s. to £10 per ton, according to grade and locality.
METHYL ACETONE.—40-50%, £43 to £46 per ton.
WOOD CREOSOTE.—Unrefined, 3d. to 1s. 3d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.
WOOD TAR.—£2 to £2 10s. per ton.

Latest Oil Prices

LONDON, Feb. 19.—LINSEED OIL was firmer. Spot, £28 15s. (small quantities); March, £26 5s.; April, £26 7s. 6d.; May-Aug., £26 10s.; Sept.-Dec., £26 12s. 6d., naked. SOYA BEAN OIL was steady. Oriental (bulk), Feb. shipment, £21. RAPE OIL was slow. Crude extracted, £34 10s.; technical refined, £36, naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £25; refined common edible, £28 10s.; deodorised, £30 10s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was unchanged. American, spot, 44s. 3d. per cwt.
HULL.—LINSEED OIL.—Spot, quoted £26 10s. per ton; Feb., £26 2s. 6d.; March-April, £26 7s. 6d.; May-Aug., £26 10s.; Sept.-Dec., £26 12s. 6d. COTTON OIL.—Egyptian, crude, spot, £25 per ton; edible, refined, spot, £28; technical, spot, £28; deodorised, £30, naked. PALM KERNEL OIL.—Crude, f.m.q. spot, £25 per ton, naked. GROUNDNUT OIL.—Extracted, spot, £30 10s. per ton; deodorised, £33 10s. RAPE OIL.—Extracted, spot, £33 10s. per ton; refined, £35. SOYA OIL.—Extracted, spot, £26 per ton; deodorised, £29. COD OIL.—F.o.r. or f.a.s., 25s. per cwt. in barrels. CASTOR OIL.—Pharmaceutical, 42s. 6d. per cwt.; first, 37s. 6d.; second, 35s. 6d. TURPENTINE.—American, spot, 45s. per cwt.

Books Received

Empire Development and Proposals for the Establishment of an Empire Development Board. By Sir Robert Hadfield. London: Chapman & Hall, Ltd. Pp. 78. 2s. 6d.
Reactions of Organic Compounds. By Wilfred John Hickinbottom. London: Longmans, Green & Co. Pp. 449. 16s.
British Plastics Year Book, 1936. London: Plastics Press, Ltd. Pp. 582. 15s.

Official Publications Received

Bulletin of the Imperial Institute. Vol. XXXIII. No. 4. 1935. London: John Murray. Pp. 120. 3s. 6d.

Forthcoming Events

LONDON

Feb. 27.—ULAWS (The University of London Animal Welfare Society). Technical Discussion on "Poisons for Rodents": "The Pathological Effects of Poisons," by J. G. Wright; "Chemical Rat-Control in Ships and Docks," by J. D. Hamer; "Poisoned Baits," by T. Howard. General Discussion opened by Dr. G. D. Lander. 5.30 p.m. 17 Bloomsbury Square, London, W.C.1.

Feb. 24.—Institution of the Rubber Industry. "Duprene: Its Applications in Industry." O. M. Hayden. 7.30 p.m. British Empire Club, 12 St. James's Square, London.

Feb. 26.—Institute of Fuel. Lecture and Demonstration entitled: "Liquid Fuel Gas." H. Pickering. 7 p.m. British Industries House, Marble Arch, London, W.1.

BIRMINGHAM

Feb. 29.—Midland Chemists' Committee. Dinner-Dance. 6.30 p.m. Midland Hotel, Birmingham.

EDINBURGH

Feb. 28.—Institute of Chemistry and Society of Chemical Industry (Edinburgh Sections). "Chemical Elixirs of Life." Professor I. M. Heilbron. 7.30 p.m. North British Station Hotel, Princes Street, Edinburgh.

HUDDERSFIELD

Feb. 24.—Society of Dyers and Colourists (Huddersfield Section). "The Prospects of Modifying Normal Wool to Manufacturing Advantage." Joint meeting with the Huddersfield Textile Society. Professor A. T. King. Huddersfield.

NOTTINGHAM

Feb. 28.—Society of Chemical Industry (Nottingham Section). Joint meeting with the Chemical Engineering and Building Groups. "Corrosion of Cement." Dr. E. B. R. Prideaux; "Classification of Hydraulic Limes." J. Ward. 7.30 p.m. University College, Nottingham.

MANCHESTER

Feb. 28.—Manchester Literary and Philosophical Society. "Microchemical Analytical Methods." N. Strafford. 36 George Street, Manchester.

Feb. 28.—Institution of Petroleum Technologists. "The Applications of Science to the Petroleum Industry." Sir John Cadman. Inauguration of a Northern Branch of the Institution. 7.30 p.m. Memorial Hall, Albert Square, Manchester.

Company News

Eastwoods Cement.—An interim dividend of 5 per cent. is announced, payable on February 28. A similar distribution a year ago was followed by a final payment of 10 per cent., making 15 per cent. The total dividend for 1933-34 was 7½ per cent.

Anglo-Chilean Nitrate Corporation.—A net loss of £490,243 is reported for the year to June 30 last. This compares with a deficit of £626,991 in the previous twelve months. Profits for the year are to be distributed in accordance with the terms of the 4½ per cent. (income) first mortgage debenture stock trust deed as amended.

The Lautaro Nitrate Co.—A working profit of £296,249 for the year to June 30 last is shown, compared with £205,617 in the previous year. Special credits arising from selling adjustments total £179,531, and after charging unpaid interest on funded and long-term debt, a net deficit of £250,920 is carried to the balance-sheet, reducing the item of "capital surplus" to £5,651,512. For 1933-34 the net deficit totalled £621,625 after making allowance for special non-recurring charges amounting to £138,336.

Bradford Dyers' Association.—For the year 1935, the accounts show a loss of £8,197 after providing for depreciation. This compares with a profit of £48,818 in 1934, after charging £162,668 for depreciation. The carry-forward this year is reduced from £26,953 to £10,606 after payment of debenture interest and transferring £50,000 from reserve. The last dividend to be paid on the ordinary stock of £2,258,794 was a total of 1¼ per cent. for 1930. The dividend on the £2,549,237 of 5 per cent. cumulative preference stock is paid to December 31, 1932.

English China Clays.—The report for 1935 states that dividends received or receivable from English Clays, Lovering, Pochin, rose from £35,646 to £56,912. After adding rents and interest received and deducting expenses, profits show an increase of £22,215 at £60,511. Preference dividends for eighteen months to June 30, 1935, paid during the year absorbed £41,902, and the balance of tax required £3,201, leaving £22,919. The ordinary dividends are resumed with a payment of ½ per cent., less tax, and after paying the preference dividend for the six months to December 31 last, the carry-forward is reduced from £7,511 to £6,296.

Borax Consolidated, Ltd.—The total revenue for the year to end-September last rose by £41,781, to £413,299. Depreciation allowance is repeated at £50,000 and tax reserve and pensions fund again receive £10,000 and £5,000 respectively. After providing for debenture interest, etc., net earnings are up from £115,203 to £155,572. In view of the increased profits the directors recommend the payment of the full year's dividend of 6 per cent. on the preferred ordinary shares and the payment of 5 per cent. on the deferred ordinary shares. The amount carried forward is higher at £232,459.

Courtaulds, Ltd.—The net profits amounted to £2,203,063 in 1935 after crediting interest and dividends on investments. This is stated to be a decline of £14,727 on the previous year's earnings of £2,217,790. The dividend on the £24,000,000 of ordinary capital is maintained at 7½ per cent., tax free, by a final payment of 5 per cent. The interim paid last August was raised by 1 per cent., to 2½ per cent., but the directors then pointed out that this was done with the object of more nearly equalising dividends. The total payment for 1933 was 6 per cent. A transfer of £70,000 is made to reserve for employees' pensions, etc. The carry-forward is reduced from £269,228 to £202,292.

Commercial Intelligence

Voluntary Liquidation

C. TOLKIEN AND CO., LTD., manufacturing chemists, Remogen Works, Sildsen, Yorkshire.—The statutory meeting of creditors was held at Bradford, when a statement of affairs was submitted which showed liabilities of £12,101 2s. 5d., and net assets of £371 11s. 8d., or a deficiency, so far as the creditors were concerned, of £11,729 10s. 9d. It was stated that the company was incorporated in 1927 with a nominal capital of £10,000, of which £7,246 had been issued, and took over an existing business. The debenture holders appointed Mr. Swallow, of Glossop, Render and Swallow, as receiver, on January 8, and since that date he had been endeavouring to dispose of the business. Accounts which had been prepared showed that during the year to December, 1930, the turnover was £18,455, whilst in the following year it increased to £21,902. During the fourteen months to February 28, 1933, the turnover was £27,506, with a net loss of £5,817, and in the period to March, 1934, there was a net loss of £1,134 on sales of £24,576. The accounts to March, 1935, showed sales of £22,296, with a net loss of £1,673. No accounts had been prepared since that date, but it was estimated that the turnover for the nine months to January last had been £13,519, with a loss of £5,323. That loss was attributed to large overhead charges and a substantial decrease in the turnover. It was further stated that three cash creditors for £1,579, £417 and £856 respectively, would withdraw their claims, and the debenture holders, who were guarantors to the bank for £2,863, were prepared, out of their debenture, to pay off that guarantee, so that the bank would not rank, and to apply the balance received by them as debenture holders towards a fund for the benefit of the unsecured creditors.—The voluntary liquidation of the company was confirmed with Mr. Swallow as liquidator, whilst a committee was also appointed consisting of representatives of Smith Parkinson and Co., Ltd., C. E. Seed, Ltd., and Clifford Briggs, Ltd.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Argentina.—An agent in Buenos Aires wishes to obtain the representation of United Kingdom exporters of herbs (leaves, roots and derivatives) for medicinal and industrial purposes, and gums (tragacanth, Arabic, sandarach, etc.) for industrial uses. (Ref. No. 121.)

Canada.—A manufacturers' agent established at Toronto wishes to obtain the representation, on a commission basis, for the whole of the Dominion of United Kingdom manufacturers of clinical thermometers. (Ref. No. 106.)

British West Indies.—A firm of agents established at Port of Spain, Trinidad, wishes to obtain the representation, on a basis to be arranged, of United Kingdom manufacturers of oil pipe. (Ref. No. 125.)

Nigeria.—The Crown Agents for the Colonies, 4 Millbank, London, S.W.1, invite tenders for the supply of petrol and kerosene to the Government of Nigeria during the period April 1, 1936, to September 30, 1936. Tender forms and conditions of contract may be obtained by interested British firms on application to the Crown Agents for the Colonies. Completed tenders must reach the Crown Agents' Office in sealed envelopes clearly marked "Tender for Nigeria petrol and kerosene" not later than noon on March 2.

Sweden.—An agent established at Gothenburg wishes to obtain the representation, on a commission and purchasing basis, of United Kingdom manufacturers of chemicals for paper industry and raw materials for margarine industry. (Ref. No. 132.)

From Week to Week

THE NAME OF British Eastern Phosphates, Ltd., has been changed to Wykeham Trust, Ltd.

THE INDIA TYRE AND RUBBER CO., LTD., and its employees distributed £435 in 1935 between Glasgow, Paisley, Renfrew and other local infirmaries and nursing associations. This compares with £413 in 1934 and £268 in the previous year.

FOURTEEN PERSONS WERE INJURED, six very seriously, in an explosion which demolished a hydrogen gas plant of the Swift Company (meat packers), at Chicago, on February 6. There were seven persons in the building at the time of the explosion. The other casualties were sustained by passers-by.

THE SOCIETY OF PUBLIC ANALYSTS will hold their next ordinary meeting on Friday, March 6, at the Chemical Society's Rooms, Burlington House, Piccadilly, W.1, at 3 p.m., when candidates for admission to the Society will be balloted for. This meeting will be followed immediately by the annual general meeting.

THE SKINNINGROVE IRON CO., LTD. (North Yorkshire), have decided to build a new blast furnace in place of one recently dismantled, to meet their growing requirements of pig iron. Dorman, Long and Co., Ltd., are to blow in three additional blast furnaces within the next five or six weeks, and to build a new furnace which, it is anticipated, will be ready by the autumn. This firm's plans will mean an increase of pig iron production equal to about 7,000 tons a week.

THE INAUGURAL MEETING of the Northern Branch of the Institution of Petroleum Technologists (postponed from January 24) will be held at the Memorial Hall, Albert Square, Manchester, on Friday, February 28, at 7.30 p.m., when Sir John Cadman, president of the Institution, will deliver an address on "The Applications of Science to the Petroleum Industry." An invitation is extended to all who are interested in petroleum and its products to attend this meeting. Tickets of admission will not be required.

THE UNIVERSITY OF LONDON Animal Welfare Society will hold a technical discussion on "Poisons for Rodents" at the College of the Pharmaceutical Society, 17 Bloomsbury Square, on February 27. The chairman will be Professor J. H. Burn, M.D., and the speakers will include Mr. J. G. Wright, F.R.C.V.S., Mr. J. D. Hamer, F.I.C., Mr. T. Howard and Mr G. D. Lander, D.Sc. The object of the discussion is to explore the feasibility of selecting and devising poisons with a view to humane considerations.

IN A CIRCULAR ISSUED TO FORMER DEFERRED SHAREHOLDERS, the directors of Imperial Chemical Industries, Ltd., state that in regard to the High Court confirmation of the scheme for the amalgamation of the ordinary and deferred shares, formal notice of appeal was given by the I.C.I. deferred shareholders committee between the dates of the decision and the judgment, and the company has been informed that the committee proposes to continue the appeal to a hearing in the Court of Appeal. The Board are advised that so long as any appeal is pending against the judgment it will be impracticable to pay to the shareholders any dividend upon that stock formerly known as deferred shares.

DESPITE THE ROUGH WEATHER IN JANUARY the shipments of china clay have opened very satisfactory in the new year. Although there were several large boats at Fowey during the month this principal port did not maintain her usual shipping volume, neither did Charlestown or the other smaller ports, but Par was above the average. Shipping details are as follows: Fowey, 35,302 tons china clay, 2,402 tons china stone, 1,636 tons ball clay; Par, 11,855 tons china clay, 32 tons ball clay, 1,460 tons china stone; Charlestown, 4,853 tons china clay, 191 tons china stone; Penzance, 380 tons china clay; Plymouth, 229 tons china clay; Newham, 87 tons china clay; by rail throughout, 6,352 tons china clay; making a total tonnage of 64,779 tons against 63,282 for January, 1935.

WHETHER A LARGE FIRM of oil distributors, through the alleged negligence of their servant in using a suggested faulty method of delivery, was responsible for a fire which destroyed a garage was the point at issue in a £2,000 claim for damages which came before Mr. Justice Charles at Devon Assizes on February 12. Thomas W. Weller, trading as Sellers and Co., Exmouth, sought to recover £2,326 9s. from Trinidad Leaseholds, Ltd., oil refiners and distributors of petrol, London Wall Buildings, London, as damages for the alleged negligence of defendants, or their servants, when petrol was being delivered from a lorry belonging to defendants into plaintiff's petrol tank. The allegation was that, instead of using a screwed union when connecting the supply pipe with the tank inlet, the lorry driver employed an open nozzle. Mr. Justice Charles said he was satisfied that there was a sudden serious flash, and that petrol vapour came into the pit because an employee of the plaintiff failed to put the dip-stick back. He was also satisfied that it was not a dangerous practice to use the nozzle or drop end. He did not believe sufficient static electricity was generated to cause a spark. He found that the fire was not caused by any negligence on the part of defendants' servants, and that the source was unknown, and he gave judgment for defendants, with costs.

FOUNDRY SERVICES, LTD., manufacturers of chemical compounds, foundry requisites, etc., Birmingham, have increased their nominal capital by the addition of £2,500 in £1 unclassified shares beyond the registered capital of £500.

ENGLISH CHINA CLAYS, LTD., has just issued its 17th annual report, from which it will be observed that the greater part of the income of the company is derived from its shareholding in the English Clays, Lovering, Pochin and Co., and as a result of the larger dividend declared by the latter company for 1934-1935 the accounts of the holding company for 1935 reveal considerable improvement. Dividends on the shareholding in the subsidiary rose from £36,646 for 1934 to £56,912 and the profit rose from £38,295 to £60,512.

THOMAS KERFOOT AND CO., LTD., manufacturing chemists, Bardsley Vale, Ashton, entertained their employees to the annual whist drive and dance in the Ashton Town Hall on February 14 when nearly 200 attended. Mr. Herbert expressed regret that Mr. Thomas Kerfoot, their chief, had a fall the previous evening and was unable to attend. Mr. Kerfoot is 95 years of age. Dr. D. Routledge moved a vote of thanks to the firm for providing so delightful an evening. Mr. H. Burlinson seconded, and Mr. Herbert responded on behalf of the firm.

THE COUNCIL OF BIRMINGHAM UNIVERSITY reports the following donations towards the new department of Industrial Hygiene: Albright and Wilson, Ltd., £150 per annum for seven years; Imperial Chemical Industries, £300 per annum for seven years; W. Canning and Co., Ltd., £1,500 to be spread over seven years; Docker Bros., varnish manufacturers, £52 10s. per annum for seven years; and Chance Bros. and Co., Ltd., £25 per annum for seven years. Canning and Co. have also contributed £1,500 to be spread over seven years towards the fund for the equipment of the chemistry department of the University, and Southall Bros. and Barclay, Ltd., have contributed £250.

THE BRITISH COLOUR COUNCIL held its annual dinner in connection with the British Industries Fair, on February 18. The council, whose object is "to standardise colour for all colour-using industries and to issue colours for all sections of the fashion trade, has, in the five years of its existence, gained a membership of over 800, of whom 47 were new members last year. It has representatives in all the Dominions, and in Austria, Holland, Finland, and Sweden; and it was hoped that Denmark would soon be added to this list. Lord Derby spoke of the importance of the "colour standardisation" achieved by the council, and standardisation, be said, brought economy and with economy profit.

KELVIN BOTTOMLEY AND BAIRD, LTD., announce that their improved fugitometer is meeting with considerable success as an apparatus for fading tests. It has been approved by the Research Associations for the Textile Industries (Fastness Committees). It is the result of many years' collaboration with the Wool Industries Research Association, and incorporates the findings of long continuous tests and experimental work. The manufacturers also produce a fade outfit, which is a simplified form of the fugitomter, with open sample holders and without the special humidifying apparatus incorporated in the fugitometer. In both of these instruments the striking feature is the tremendous saving in time as compared with fade testing in the ordinary way.

JOSEPH ANDERSON AND SONS, LTD., rubber reclaimers and manufacturers of carbon bisulphide, Bank Street, Clayton, Manchester, received confirmation of reduction of capital, in the Chancery Court, at Manchester, on February 17. It was stated that the company was incorporated in July, 1902, and the nominal capital was £100,000 in £1 shares, of which 70,000 had been issued and were fully paid. In recent years the price of raw rubber had dropped to a fraction of the former amount, and this controlled the price of the rubber waste which the company manufactured into reclaimed rubber; therefore less capital was required to finance the purchases. The fall was likely to be permanent. It was proposed to return 4s. per share to the holders of the issued shares, reduce all the shares to 16s., and then increase to the original figure of £100,000 by creating 25,000 shares of 16s. each.

AN INFORMAL DISCUSSION on "The Training of Industrial Physicists" was held under the auspices of the Institute of Physics in the rooms of the Royal Society on Friday 11. Among those present were representatives of nearly every University and College in Great Britain and Ireland, of firms employing physicists, and of research associations and Government establishments. The opening speakers were Mr. A. P. M. Fleming, of the Metropolitan-Vickers Electrical Co., Ltd., Dr. W. H. Hatfield, of the Brown-Firth research laboratories, Mr. C. C. Paterson, of the General Electric Co., Ltd., Professor R. Whiddington, of the University of Leeds, Dr. R. H. Pickard of the British Cotton Industry Research Association, and Professor J. A. Crowther, of the University of Reading. The suggestions and comments made at the meeting and in writing are receiving the consideration of the board of the Institute, which it is anticipated will issue a memorandum on the subject.

APPOINTMENTS VACANT

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